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FLIGHT

AIRCRAFT, SPACECRAFT, MISSILES

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## Minister Without Precedent

ASKED when he would be able to make a statement on Government policy regarding the organization of the aircraft industry, our new Minister of Aviation replied that he hoped to do so "quite soon." His pronouncement cannot come a single day too early. So much was clear from the news that the Minister gave out last week—that Fairey are no longer prepared to proceed with Rotodyne development on the basis already agreed. There was some ugly talk in the House of "war-time action" and "takeover"; and though the Minister rejected these possibilities, he declared that Fairey was "not a very strong firm."

When Mr. Sandys was appointed to his new post the uneasiness of the nation respecting the industry was in a large degree assuaged. It was widely acknowledged that, unpalatable as was his Defence White Paper, his main decisions were right. In preparing that Paper he had the definite mandate of producing a rationalized defensive system; but as Frank Beswick has remarked in these pages, he now has no precedent to guide him, nor has he any special directive or mandate save generally to improve prospects in the aviation business. In this he has much goodwill, though the Fairey decision shows how lack of understanding, on one side or the other, can rupture relations to a deplorable degree. We believe that the Minister will tackle his new job as he did Defence: he will press forward in spite of cavilling and misinterpretation. But he must not forget that, though the firm of Fairey may not be "very strong," it is nevertheless very great.

## Long-term Short-range

SEVERAL interesting trends have been observable since the bitter altercation at Montreal last February led to the confirmation and extension of V.H.F. omni-range as the standard short-range navigation aid. Firstly, the defeat of Decca in a head-on collision with V.O.R. appeared so decisive that many people are still wondering how and why it happened—and are accordingly taking an increased interest in the Decca system. Despite the Montreal debacle the British Government has maintained its support for Decca; and the Americans, apparently regretting having rocked the boat so violently, seem keen on avoiding another head-on clash at all costs. Equally anxious to achieve peace, the British are thinking that perhaps they should not have tried to beat the Americans at their own high-pressure tactics. The two countries have now agreed to exchange technical information, not only on navigation aids but on related topics as well.

Of the nations on the sidelines, some are confirmed in V.O.R.-ism, but others are relatively uncommitted and are prepared to take a closer look at Decca. Italy is a particular case, and recent demonstrations in the Rome area created something of a sensation. Another demonstration, in the Channel Islands control zone, may well lead to the setting up of a Decca-based high-density traffic area in which no other aid could provide as good a service. In October the fourth Jet Operations Requirements Panel meeting confirmed the stated requirement for an area-coverage aid. The Amber One Decca climb-out route from London Airport is getting some envious glances from non-Decca operators.

While the Americans are working to bring V.O.R. to peak efficiency, to serve a jet age already here, Decca is quietly confirming old friendships and making new ones. Forecast technical improvements are becoming ever more tangible and a few years hence the British aid may have something to offer which operators will not only be unwilling, but unable, to ignore.

# FROM ALL QUARTERS

*ROYAL EXIT: Doors of military (and even some civil) aircraft are no respecters of heads, and long familiarity with their stunning-potential is evident in this picture of the Duke of Edinburgh. It was taken when, as recorded last week, he was in the co-pilot's seat of a Canberra for three blind landings by the B.L.E.U. system*

## Operational Thor

THOR has now taken its place in the operational front line of the R.A.F. This was stated by the Air Minister, Mr. George Ward, in Parliament on December 9. He said that the Air Ministry was satisfied that Thors could now form a part of R.A.F. operational equipment. (There are to be four squadrons, of 15 missiles each, deployed in Eastern England.)

On December 2 a Bomber Command crew fired a Thor at night from Vandenberg A.F.B., under simulated combat conditions, the four men concerned being—says a U.S. source—"unaware they were to launch the weapon until minutes before blastoff." It was the ninth R.A.F. firing.

## RB.141 Runs

ON December 9 Rolls-Royce announced that the RB.141 transport engine has satisfactorily completed its first bench run at Derby. The RB.141 is the first of the second generation of by-pass turbojets of increased C/H ratio which Rolls-Royce have designed as the optimum powerplants for future airliners. It will start life at about 15,000 lb thrust and will be available for airline service in 1962.

## Avro WS606A

DR. HERBERT R. YORK, U.S. Defense Department Director of Research, blew hot and cold on the "flying saucer" developed by Avro Aircraft as U.S.A.F. Weapons System 606A.

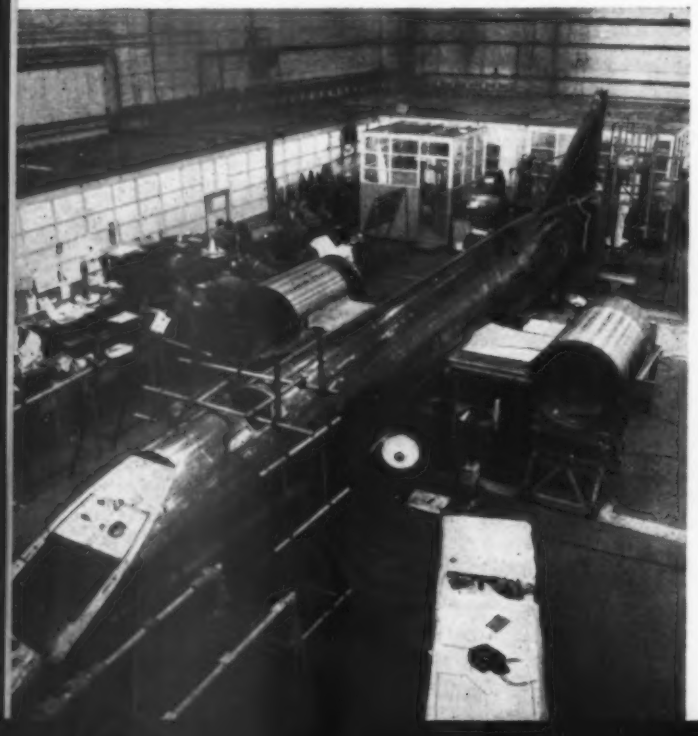
The aircraft (see *Flight*, November 6), flew for the first time on December 5 at Malton. Dr. York said that the revolutionary concept was but one approach to the problem of achieving VTOL capability, and might prove inferior to competing systems.

## West German Defence Orders

MAJOR expansion of the German F-104G Starfighter programme will result from the decision by the Bundestag on December 10 to produce 364 of these aircraft, in addition to the 296 previously scheduled. These machines, which will cost about DM 2,500m (about £208m) with spares, will enable the Luftwaffe to operate only two combat types, the F-104G and the Fiat G.91. Both are being produced in Germany.

At the same time Lockheed announced that the German Government had agreed to licence-manufacture of the F-104G in Belgium and Holland. Next month these countries are expected to announce a decision upon their new fighter, of which 370 are reported to be required; also in the running are the Northrop N-156F, Republic F-105D and Dassault Mirage 3.

It was also announced on December 10 that the Bundestag defence committee has approved plans to purchase a substantial number of Martin TM-76 Mace missiles. The vote under this heading was DM 480m (about £40m).



## Indian Darts

EARLIER this month the Indian Deputy Defence Minister, Sardar Surjit Singh Majithia, stated that an agreement had been concluded with Rolls-Royce Ltd., for licence production in India of the Dart turboprop. This will enable India to manufacture powerplants to suit her own production of Avro 748 and 758 airframes, to meet the requirements of the Indian Air Force.

India is already nearing the stage when she will begin to deliver Orpheus turbojets for Gnats, licence-produced by agreement with Bristol Siddeley in a new facility in Bangalore.

## Lightship Rescue

SYCAMORES of No. 228 Sqn., based at Leuchars, carried out a brilliant rescue operation during the storms which recently swept the coast of Britain when on December 9 they took off the captain and crew of six from the *North Carr* Lightship in a 60 m.p.h. gale. Two of the Bristol helicopters were involved in the rescue operation, which was commanded by F/L. J. E. McCrea. The vessel, which had drifted from her station and was being held by one anchor only two miles offshore in St. Andrews Bay, was being constantly buffeted by waves 20ft high. So as to make room for winching, the lightship crew chopped down the 40ft high after-mast, while the helicopters circled for 35 minutes. An attempt was then made to lower F/L. S. Moreau to help the seamen into the rescue harness, but this proved unsuccessful. Ultimately, the crew were able to attach themselves when the harness was lowered and one by one were brought to safety, the operation taking only 27 minutes.

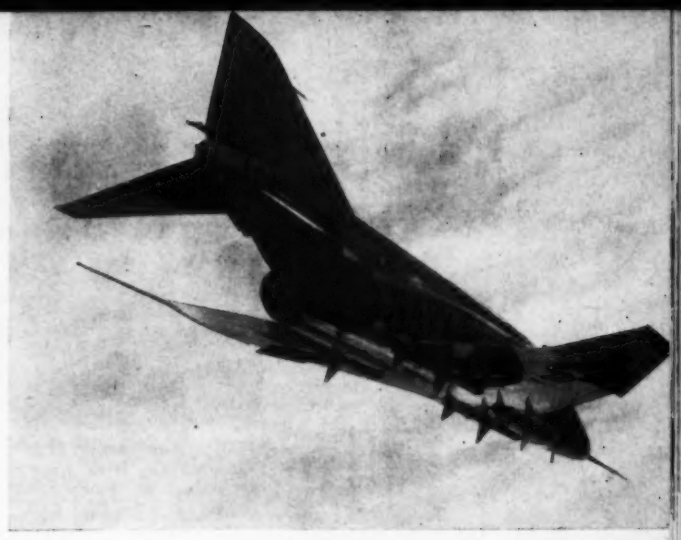
## U.S. Defence and the B-70

EARLIER this month Neil McElroy retired from his post of Secretary of Defense of the United States, after holding this office since October 9, 1957. He is succeeded by Thomas S. Gates, who was previously Secretary of the Navy.

The new Secretary takes over at a time when a general relaxation in international tension appears to be reflected in increased reluctance to support massive defence budgets. One of the first major cuts in spending will accrue from the decision to reduce the strength of the U.S. Air Force by some 20,000 men during the coming calendar year. Earlier this month it was also announced that by the end of 1960 up to 900 aircraft will be retired from U.S.A.F. service, and approximately 12 operating bases will be closed.

Moreover, the U.S.A.F. is reluctantly, if gradually, abandoning plans for ever more advanced combat aircraft. The two most advanced aircraft of all now appear to be stillborn as operational types—a body-blow to North American Aviation, whose Los Angeles Division held the prime contract for both. The F-108

*BOXKITE, BRISFIT, BULLDOG, B——?: As yet unnamed, the Bristol 188 high-speed research aircraft (D.H. Gyron Junior DGJ.10R engines) is now in final assembly at Filton; Bristol Aircraft expect to fly it next spring. A description appeared in "Flight" last week*



***NO EARTHBOUND PHANTOM, the McDonnell F4H-1 which bears this spritely name climbed on December 6 to a height of 98,560ft with Cdr. Lawrence E. Flint, Jr., as pilot. The U.S. Navy is claiming a new world altitude record for this flight. The Phantom 2, powered by two General Electric J79-2s, is to carry Sparrow and Sidewinder missiles and is seen here with Sparrow 3s***

Rapier long-range intercepter was cancelled on September 23; and on December 1 the Air Force announced laconically that the B-70 Valkyrie programme "is being reoriented to a prototype aircraft programme," stating that the budget for FY 61 (to be presented to Congress in January) would ask for about $75m (£26,785,000) for the aircraft, instead of $160m. Major sub-contracts have been "cancelled as an economy move," and the first flight has been delayed by one year.

This re-appraisal of the B-70 is the outcome of a major change in strategic policy—or, rather, a final admission that when there are insufficient funds for everything the 2,000 m.p.h. bomber must go. During the past three years North American's two M3 canards have transcended in scope and difficulty anything previously attempted by any aircraft company. To tackle the job N.A.A. sought the assistance of a host of sub-contractors, practically all of whom are now feeling the draught severely. Assuming that a B-70 aircraft gets off the ground at all, only two are likely to be built and the first will fly in 1963. The U.S.A.F. must have almost given up hope of ever putting such an aeroplane into inventory service. Instead the B-70 will assist the evolution of a 2,000 m.p.h. airliner.

## The Sandys of Time

*THE following appeared in "Flight" of November 5, 1910:—*

"Near Taplow, on the banks of the Thames, there is being built a huge machine of the helicopter species which its inventor calls by the name 'Gyropter.' It is unfinished, and it is likely to remain unfinished unless others who are as interested in this particular problem as the inventor himself come forward to his financial assistance."

*The following could well appear in today's issue of "Flight":—*

"Near Taplow, on the banks of the Thames, there is being built a huge machine of the helicopter species which its inventor calls by the name 'Rotodyne.' It is unfinished, and it is likely to remain unfinished unless others who are as interested in this particular problem as the inventor himself come forward to his financial assistance."

## Hamble to Perth

PLANS are now complete for the transfer to Airwork Services Training at Perth in Scotland of the engineering school that has formed part of Air Service Training Ltd. at Hamble for the past thirty years. The move of technical staff and facilities from Hampshire northwards is to take place during next year's Easter holiday, when the present Hamble organization gives place to the new Government-sponsored College of Air Training, which is for pilots only. Engineering students will thus be able to continue work after the holiday without any break in their curriculum. So far, 107 students have been enrolled for the first term at Perth, where Airwork have operated a flying school since 1932. Plans are afoot to adapt existing hangars and buildings as extra class-rooms and workshops; and some new buildings are to be erected to house extra living accommodation and recreation rooms.

## N.S.U.'s Unconventional Engine

A MAJOR advance appears to have been achieved by the N.S.U. Werke, in Neckarsulm, Germany, with an entirely new type of prime mover known as the N.S.U.-Wankel engine in recognition of its designer. Although an internal-combustion four-stroke, it has no reciprocating parts and is claimed to be simpler, lighter, more compact and efficient than any previous powerplant in its class. As an example a 125 c.c. unit delivers 29 b.h.p., yet weighs but 20 lb.

Applications are expected to embrace light aircraft and helicopters as well as a very wide range of surface craft. N.S.U. are concentrating on relatively small units, but their licensees, the American Curtiss-Wright Corp., are interested in engines rated at over 1,000 h.p., chiefly for marine purposes. More extensive technical descriptions have appeared in the December 4 and December 11 issues of our associate journal *The Autocar*.

***CANTONAL PORTERAGE: The second prototype of the Swiss Pilatus Porter has been visiting England and is seen here from "Flight's" Gemini. It is a 6/8-seater utility STOL powered by a Lycoming GSO-480 of 340 h.p. Loads include stretchers, cameras, freight or passengers***

## IN BRIEF

Reports from Paris and Canberra indicate that the R.A.A.F. has recently been studying the Dassault Mirage 3 as a possible Avon-Sabre replacement.

Lord Sempill represented Britain last week at the celebrations in Venezuela to mark the 39th anniversary of the Venezuelan Air Force, to which he has been adviser during the past twenty years.

Yesterday (December 17) was being observed as Wright Brothers Day in the United States. It was recently designated as such by President Eisenhower to commemorate the anniversary of the first controlled mechanical flight by Orville and Wilbur Wright, on December 17, 1903.

The U.S.A.F. is claiming an unofficial world height record for helicopters following a flight by Capt. W. Hodgson in a Kaman H-43B in which he reached an altitude of 29,770ft. He made the flight, with a co-pilot, from the grounds of the Kaman factory at Bloomfield, Conn.

M. Jean Blancard, the French Minister for Air, was a guest of the British Government from December 9 to 12. He had discussions with Mr. Duncan Sandys, the Minister of Aviation, and visited some research establishments and aircraft companies.

As part of a Christmas holiday programme of demonstration lectures for young people 13-17 years of age (and accompanying adults) at the Science Museum, South Kensington, Victor Wall will speak on *The story of flight* at 2.30 p.m. on December 30 and 31.

Mr. Peter Hering, publicity manager of Westland Aircraft Ltd. and associate companies for the past five years, has resigned his appointment. Prior to joining Westland he was publicity manager of Flight Refuelling Ltd.

Unofficial reports aver that the German VTOL fighter which may be adopted for the R.A.F. is being developed principally by Messerschmitt AG. According to the *Sunday Times* it will fly at 2,500 m.p.h. and will be powered by a Rolls-Royce RB.153 (the Derby company do not confirm the report that this turbojet can feather its blading and behave as a ramjet). The *Daily Telegraph* says that the aircraft is "still in the drawing-board stage."

*The successful recovery of a Project Mercury capsule containing Rhesus monkey Sam is reported on the opposite page. These photographs show (from the left) the launching by Little Joe rocket; recovery of the capsule on board U.S. Navy destroyer "Borie"; and the monkey, apparently quite fit, being lifted out of his container after the flight*

# Missiles and Spaceflight

## ADVISORY COUNCIL VIEWS ON BRITISH SPACE RESEARCH

FOR Britain to shoulder the "crippling cost" of a large space exploration programme on a purely national basis would be "the grossest folly." This was the not-unexpected viewpoint put forward by the Advisory Council on Scientific Policy in its annual report published on December 8. The relevant section of the report is reproduced in unabridged form below.

The members of the Advisory Council for the period covered in the report were: Prof. Sir Alexander Todd, chairman; Prof. Sir Solly Zuckerman, professor of anatomy, Birmingham University, deputy chairman; Prof. T. A. Bennet-Clark, professor of botany, King's College, London; Prof. Sir Lindor Brown, secretary, Royal Society; Sir Frederick Brundrett, scientific adviser to the Minister of Defence; Sir John Cockcroft, Master of Churchill College, Cambridge; Sir George Edwards, managing director, Vickers-Armstrongs (Aircraft), Ltd.; B. D. Fraser, Treasury; Sir Harold Himsworth, Medical Research Council; Sir Harry Melville, secretary, D.S.I.R.; Sir Keith Murray, chairman, University Grants Committee; E. M. Nicholson, director-general, Nature Conservancy; Prof. Sir Alfred Pugsley, professor of civil engineering, Bristol University; Sir William Slater, secretary, Agricultural Research Council; and Dr. Charles Sykes, managing director, Thos. Firth and John Brown Ltd.

During the past year [the Council state] we were asked to consider the question of British participation in space research and, in particular, a proposal originating with a group of Fellows of the Royal Society led by Professor H. S. W. Massey, that the United Kingdom should embark upon a programme of scientific experiments in the upper atmosphere and in extraterrestrial space, by means of a series of Earth satellites launched by vehicles developed from British military rockets adapted to this purpose.

The programme put forward listed a number of possible scientific applications of artificial Earth satellites, including the systematic study and measurement of the properties of the upper atmosphere, of solar electromagnetic radiation and other types of radiation reaching the Earth's atmosphere, and the Earth's magnetic and gravitational fields.

After discussing these proposals with Professor Massey, the Ministry of Supply, and the Department of Scientific and Industrial Research, we advised the Lord President that in our opinion it was desirable that the United Kingdom should embark upon a scientific programme of space research, by means of a series of artificial Earth satellites, the programme to be financed from public funds. Having regard to the prior claims of defence, the production of modified British rockets would take at least five years. It would also be very costly. We therefore recommended that, before reaching a decision as to whether the United Kingdom should attempt to launch its own satellites, an approach should be made to the United States authorities to ascertain what facilities they were prepared to offer for carrying out a joint programme; and that the possibility of Commonwealth co-operation as well as collaboration with other countries through COSPAR (the International Committee for Space Research set up by the International Council of Scientific Unions) should be fully explored.

We welcomed the announcement by the Prime Minister on May 12 which indicated that Her Majesty's Government had accepted our advice and had authorized a programme for the design and construction of instruments to be carried in a series of Earth satellites. The Prime Minister also announced that design studies were being put in hand for the adaptation of British military rockets for a possible future satellite programme. We also welcomed the generous offer of the U.S. Government to provide facilities for international co-operation and we were glad to learn that, as a result of the visit to Washington of a team of experts led by Professor Massey, the United States National Aeronautics and Space Administration have agreed to provide space, in a series of satellites to be launched over a period of three to four years, for a number of British instruments designed to carry out a scientific programme under the general supervision of the British National Committee for Space Research, established by the Royal Society. Agreement was also reached during the visit for United Kingdom participation in a joint United States-Canadian programme of satellite experiments in the ionosphere.

The British National Committee on Space Research will be the body primarily concerned with scientific problems and with supervision of the authorized scientific programme. Ultimate financial responsibility will rest with the Department of Scientific and Industrial Research. In addition, the Lord President has set up a Steering Group under Sir Edward Bullard to supervise and to co-ordinate the general Government interest in the programme. The membership includes Professor Massey and other nominees of the Royal Society as well as representatives of the Government departments concerned. With the establishment of this Steering Group our direct concern with the present programme of space research has come to an end, but we should like to take this opportunity of setting out certain principles which we believe should underlie British participation in this exciting new field of endeavour.

The U.S.A. and the U.S.S.R. have, of course, been pioneers in this field. Space research, especially when it proceeds beyond the stage of launching small Earth satellites, must make enormous and increasing demands on scientific and financial resources, and it should be remembered that American and Russian activity in this field has arisen in very large measure as an offshoot of expenditure incurred in the development of long-range ballistic missiles for military purposes. We in this country cannot hope to provide all the resources necessary to develop space exploration independently on an equal footing with these two great nations. Scientific prestige is obtained through research which is important scientifically and is well planned and executed, and does not depend on the size or spectacular nature of the project. Our scientists have already contributed valuable results in the field of upper-atmosphere research with vertical sounding rockets, and we have no doubt that they are also capable of making at least an equally valuable contribution to space research if they are provided with the means to carry their scientific instruments into space.

Carefully designed experiments using Earth satellites can contribute to the answer of a number of important scientific problems, and in many cases may well prove the most economic method of

obtaining the required data. Because the cost of venturing into space with lunar, planetary or solar probes would be too great for our resources, and because we do not think that the scientific and technological return to be expected is likely to be commensurate with that cost, we have not recommended any British participation in these activities at the present time, nor in the attempt to launch human beings into space. Although much scientific effort is being expended by the U.S.A. and the U.S.S.R. on satellite work, and valuable results have already been obtained, we are convinced that there is plenty of work still to be done which will provide material for a useful programme for our scientists for many years to come. The cost of the present programme, which has been estimated at between £100,000 and £200,000 per annum for the next few years, is not out of line with other programmes of scientific research of similar importance. This figure does not, of course, include the cost of the launching vehicles or of the possible adaptation of British rockets to provide such vehicles.

It is sometimes suggested that the technological stimulus of a space research programme, and the prestige accruing to the engineering industry, would in itself justify such a programme. We recognize that the scientific programme at present authorized will not in itself have a significant impact on British industry, apart from some stimulus to developments in micro-instrumentation. At the same time we do not consider that the technological advantages likely to accrue from the development of a British rocket and satellite programme designed for civil purposes, over and above the effects of the existing military missile programme, would be sufficient to justify the very considerable expenditure involved. The Ministry of Supply is carrying out design studies on the adaptation of British military rockets. When these are available, it will be possible to decide whether the additional expenditure and diversion of effort involved in a purely British satellite programme would be justified by the results which can be expected.

No one can deny the attraction of space research and space exploration, nor can it be doubted that valuable scientific knowledge will accrue from them. But the magnitude of the effort involved in a substantial programme of space exploration, both in terms of money and manpower, is so great as to put its development and operation beyond the reasonable capacity of any but the wealthiest of nations. This Council has repeatedly emphasized the importance of adequate expenditure on research and development in fields of endeavour which are vitally important for the welfare of our people and for the strengthening of our economic position, as well as for the improvement of living standards in the less well-developed countries, particularly in Commonwealth countries and colonial territories. To leave these needs unsatisfied in order to shoulder the crippling cost of a large programme of space exploration on a purely national basis would be, in the Council's view, the grossest folly.

Here surely is a situation in which the proper solution lies in a co-operative effort by all nations. We believe that British science and technology have much to contribute in this field and that they should do so. But these contributions should be made in specified directions appropriate to our special skills and they should be part of an internationally based approach to the whole field. We therefore consider that every effort should be made to establish such an international co-operative effort, and we particularly welcome the newly established co-operative agreement with the U.S.A., already mentioned, as a step towards this goal.

## TRIPLE SKYLARK FIRING

It was announced on December 4 by the Ministry of Aviation and the Royal Society that three Skylark rockets had been launched within 36 hr on November 30 and December 1 from the Weapons Research Establishment rocket range at Woomera.

The first of the three Skylarks carried out the sodium vapour experiment devised by Queen's University, Belfast. This involved the ejection of sodium vapour at heights above 40 miles: optical observations of the resulting glow, made with an interferometer and ballistic cameras, provided data on atmospheric temperature and winds.

The second Skylark measured atmospheric temperature and horizontal and vertical wind-speeds at heights up to 90 miles by means of a sound ranging method. This experiment, based on optical and acoustical observations of explosive grenades released at regular intervals, was planned by University College, London. In addition, radar tracking of ejected metal foil enabled an independent estimate of wind velocities to be made by a group from Imperial College, London.

The third Skylark carried three experiments. The first two were identical with those of the second rocket and the third involved the measurement of electron densities in the ionosphere —a project of the Department of Electron Physics of Birmingham University.

*First engine, other than small experimental units, to operate on liquid hydrogen, the LR115-P-1 has been developed by Pratt & Whitney Aircraft at West Palm Beach. Noteworthy features of its design are its compactness and the very high expansion ratio. Twin LR115s will power the Centaur second-stage*

## SAM-IN-SPACE PROJECT

As part of the U.S. Project Mercury programme, a capsule containing a 7 lb Rhesus monkey named Sam was launched by a Little Joe rocket from Wallops Island on December 4 and, after attaining a height of 55 miles, was successfully recovered some 200 miles offshore. The monkey was said to be in good physical condition after the flight.

Thirteen minutes after launching, the one-ton capsule descended by parachute into the Atlantic, and its radio-beacon signal was received by a U.S. Navy patrol aircraft almost immediately. Within 40 min the capsule had been located with the aid of its dye marker in the water. Recovery of the capsule on board the destroyer *Borie* was effected two hours after the launch time.

The main objective of the firing was to test the emergency escape rocket equipment. The escape rockets were fired at an altitude of 20 miles, carrying the capsule away from the booster a further 35 miles before release of the escape pylon. The drogue parachute opened at 20,000ft and the main parachute at 10,000ft. The monkey made the flight in a contoured couch, lined with shock-absorbing plastic foam and contained in a 100 lb chamber 36in long and 16in in diameter. Electronic devices recorded his reactions, heartbeat, and respiration. He had been trained to move a lever in response to a light signal in order to ascertain his ability to react during the flight. Other test objectives were to measure the effects on the monkey of high acceleration and weightlessness; and the effect of radiation on small biological specimens which were also carried.

## LIQUID-HYDROGEN ENGINE

Among the wide range of conventional chemical fuels which may be employed in rocket propulsion, liquid hydrogen offers the greatest potential specific impulse, owing to its exceedingly low molecular weight, both as stored and in the gaseous form in the jet. During the past four years the U.S. Air Force Air Research and Development Command have been developing experimental engines using hydrogen fuel, and this work solved many of the basic problems in the handling of the coldest substance on Earth (even under slight pressure it must be stored at −423 deg F). From this work stemmed a research contract by ARPA which finally led to the NASA contract to Pratt & Whitney Aircraft for an integrated propulsion system for the second stage of the Centaur space vehicle.

This propulsion system employs two gimbal-mounted chambers each rated at 15,000 lb thrust at sea level, operating on liquid hydrogen and liquid oxygen. The engine, which is designated LR115, has been under development by Pratt & Whitney's new division at West Palm Beach, Florida, for two years, and it was recently announced that the complete powerplant has accomplished successful firings. As the photograph shows, elimination of a separate gas-generator and the mounting of the turbopump directly on the chamber has made the engine singularly compact. The liquid hydrogen circulates through the tubes of the thrust chamber —causing the chamber actually to contract during firing, notwithstanding the combustion temperature of 5,500 deg F—before it passes through the turbopump and then into the chamber itself. Pratt & Whitney appear to have a clear lead in this field.

# FLIGHT SYSTEM SURVEY

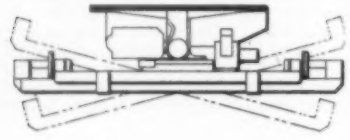
## *Radar 500 and TNC-50*

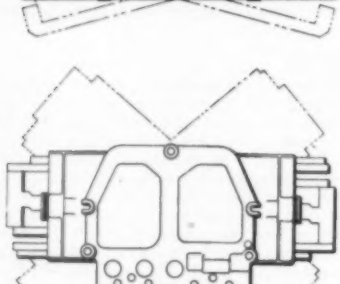
FOLLOWING two earlier civil Dopplers, General Precision Laboratory Inc. of Pleasantville, N.Y., have now released information on the Radan 500 commercial Doppler and TNC-50 computer. The equipment conforms to Arinc characteristics 540 and 543, but differs from most other commercial units so far produced in employing a self-coherent pulse transmission system which, it is claimed, eliminates the need for exact frequency control and precise vertical reference. The aerial automatically compensates for transmitter frequency variation by a corresponding change in propagation angle. Modulated pulse repetition frequency eliminates "altitude hole" effects.

Radan 500 will operate at groundspeeds from 70-1,000 kt, at heights from 200-50,000ft and over drift angles of ±40 deg. Claimed accuracy is 0.2 per cent+1 kt in groundspeed and 0.2 deg in drift angle. The aerial is pitch-stabilized by mercury switches over ±15 deg. The TNC-50 navigation computer uses groundspeed and track-made-good signals from the Doppler equipment to monitor progress along one of two preset tracks manually set on the control panel. Outputs are in the form of counter indications of nautical miles to go and nautical miles left or right of track. The Doppler indicator shows meter indication of drift and counter indication of groundspeed.

Transmitter/receiver and frequency-tracker are respectively housed in short ½ ATR and long ½ ATR cases and weigh 15 lb and 33 lb. Aerial and stabilization weigh 15 lb and are 5.5in deep. The multiple linear wave-guide array itself measures 21.3in by 9¼in, is tilted ±15 deg and swivelled ±40 deg. G.P.L. claim to have produced more than 1,500 Doppler radars, mainly for military use, during the last 13 years.

In the Radan 500 transmitter, the p.r.f. of the magnetron oscillator is determined by random voltage pulses from a noise generator. At half-second intervals the transmitter output is switched from right front and left rear beams to left front and right rear beams. The received echoes are fed to a microwave superheterodyne receiver, converted to I.F., amplified, mixed and detected. The resulting audio signal is used to control a frequency generator which then produces a signal proportional to groundspeed which is passed to the indicator and held as a synchro shaft position for remote computer operation.





*Elevation and plan views of the G.P.L. Radan 500 civil Doppler aerial. It is pitch-stabilized and swivels to measure drift angles up to a maximum of 40 deg*

The two signals derived from the two pairs of beams are compared in the main tracking loop and the aerial is positioned to lie parallel to the track of the aircraft. Aerial position provides drift angle indication which may be electro-mechanically compared with an external compass reference. A signal-to-noise ratio detector monitors the main tracking loop for audio signals and, should those from both beam patterns disappear simultaneously, groundspeed and drift angle shafts are locked at the last correct readings. The frequency generator is then swept through its range until audio reappears, the aerial is slewed, both signals are once again detected and the indicator continues to operate.

*Some of the Creed Teletype Transceivers in use in the B.O.A.C. control room at London Airport. Messages are written on the tape and automatically transmitted on to the tape of another machine as soon as the cover is closed over the tape mechanism*

Groundspeed and drift angle indications may be manually slewed if, for example, the TNC-50 computer is to be used for plain D.R. navigation.

Because the accuracy of Radan 500 does not depend upon precise transmitter frequency, the emphasis in this unit is on long life and reliability. Five long-life tubes are incorporated as well as magnetron and klystron; and an elapsed-time meter records the total time for which the system has been in use. The frequency-tracker is completely transistorized and zero-frequency tracking makes accuracy independent of filter characteristics. The aerial is designed for reliability and ease of installation, with quick-release connections. Aerials may be changed without matching or recalibration.

Extensive use is made of transistors and modular construction and individual units may be changed without recalibration. Training and spares assistance is available and G.P.L. have designed two types of test equipment either for flight-line or overhaul use. The former equipment consists of two portable units with which a full go-no-go check may be made. No details of price have yet been released.

## *Lightning Simulator*

Now being installed at "a Fighter Command station in East Anglia" is a flight simulator for the Lightning F.1 manufactured by the Air Trainers Link division of General Precision Systems Ltd. It is the first of a number ordered by the Ministry of Aviation for pilot training and can simulate both the flight of the aircraft and the operation of its fire-control equipment. Pilots will therefore be able to carry out complete tactical flights up to the point of interception. The simulator is claimed to be the most advanced of its type in Europe.

## *U.H.F. for Portugal*

FOURTEEN Elliott VB 2001 ground-to-air radios have been ordered by the Portuguese air force. The VB 2001 is a simplified U.H.F. radio covering the 225-400 Mc/s band with four crystal-controlled frequencies spread over a preselected 10 Mc/s band. With single-channel simplex operation this offers a cheap and simple communications service where no more than four channels are required. The radio is mounted in a cabinet with its power unit and can be remotely controlled from a distance of up to 20ft.

## *B.O.A.C. Uses Creed Teletype*

SIX Creed Teletype Transceivers are being used in the B.O.A.C. control centre at London Airport for high-speed facsimile communication of brief hand-written messages over short distances. Five of the six instruments are used in connection with crew rostering work carried out by the various aircraft fleets.

Messages are hand-written on special tape and transmitted in 18 sec to tape on another machine. Signatures can be used and reception is entirely automatic, with light warnings when the line is occupied or free. The tape forms a permanent record and verbal errors are avoided. Noise level in the control room is lower than it would be if telephones were used.

## *Elliott-Manurhin Co-operation*

NEGOTIATIONS have been proceeding between Elliott Automation and the French company Manufacture de Machines du Haut-Rhin S.A. (Manurhin) at Mulhouse with a view to arranging the manufacture in France of Automation equipment. Elliott proposes to take a financial interest in Manurhin.

# What Price State Aid?

INSIDE the cockpit of the Douglas RB-66B Destroyer twin-jet reconnaissance bomber displayed statically at the Paris Show was a small metal notice-plate mounted in a position where the pilot could see it:—

> **This aircraft cost us $2,440,819·00**
>
> **PLEASE HANDLE WITH CARE**

This was a fascinating piece of information, not least because of the fastidious accuracy and the revelation that an RB-66 costs nearly half as much as a JT4-powered, domestic version of the Douglas DC-8. This fact in itself is not merely an intriguing triviality, for it provides a key to one of the most important and potentially controversial issues in British air transport: who should pay for the pre-operational development costs of new airliners—Government, Corporations or manufacturers?

This question is one around which a host of misconceptions has gathered, and the case for State payment of development costs is usually based on the argument that (to quote the recent Select Committee report) "American airline operators have the advantage of having development flying done for them by the Services." Because the United States Air Force placed large orders for commercial aircraft, the Select Committee concluded that the civil user was spared much of the development cost. But an examination of the histories of post-war U.S. airliners will show that exactly the opposite is true: in most cases it has been the civil users who have had to bear the brunt of early teething troubles, while large U.S. military orders have not been placed for production airliners until after they had been in service for some time, and their early teething troubles rectified. In fact, it is more true to say that in ordering off-the-shelf airliners the U.S. Air Force and Navy have been able to take advantage of development flying done for them by the airliners.

Frankly, it is difficult to understand why the misconception that the commercial success of American airliners owes so much to military backing has taken root so firmly. Possibly it is because we have tended to excuse our past mistakes with the comforting and complacent half-truth that whereas the British have the ideas, the Americans have only the money. Be that as it may, it is worth examining two U.S. airliner case-histories in some detail, because they demonstrate to an unusual degree the fallacy of the idea that large-scale military backing is an open sesame to both a trouble-free commercial career and large export orders.

The Douglas DC-6 prototype first flew in U.S.A.F. markings as the XC-112A-DO on February 15, 1946, and was followed by a second, commercial prototype. Apart from the 29th, delivered as a C-118-DO V.I.P. transport for President Truman, there were no military orders for the DC-6 and first commercial deliveries were made to American and United. Following the loss of a United DC-6 which caught fire in the air on October 24, 1947, and the forced landing of an A.A. DC-6 in New Mexico 18 days later (again through an in-flight fire), Douglas requested the grounding of 97 DC-6s then operating, and the type remained grounded for four months.

As a result, United, American, National, Braniff, Panagra and Sabena lost something like $12m between them while their DC-6s were grounded, while Douglas spent more than $7m on putting the DC-6's troubles right. First of the DC-6 series to gain large military orders was the DC-6A, 167 of which were supplied to the U.S.A.F. and U.S. Navy, and this version of the DC-6/DC-7 series, fully cured of the DC-6's early troubles, was the only one of the series (of which more than 1,000 aircraft were built) to have the benefit of large military orders. Even so, it is interesting to quote a Douglas official's statement to the Hebert Committee in 1956 that over 400 DC-6/DC-7 aircraft were delivered before the company broke even.

The Lockheed Constellation was another instance in which airlines, and not military users, suffered most from early teething troubles. Although designed to T.W.A.'s requirements, the Constellation entered service with the U.S.A.A.F. in 1944 as the C-69, and 22 of these military transports were built in 1944-46; most of them later became L.049 Constellations, of which 88 altogether were built. This version entered airline service with T.W.A. in February 1946 but was grounded in July of that year for about a month as a result of engine fires and trouble with the cabin supercharger drive shaft. Even though a certain amount of military flying had been done by C-69s before the Constellation entered airline service, this did not save it from being grounded; and similarly military experience with the Boeing KC-135 Stratotanker has not ensured a trouble-free commercial life for the 707. It is important to remember also that the 707 is the only new American airliner with military experience behind it. The DC-8, Electra, Friendship, CV-880, and CV-600 are all being operationally developed entirely by the airlines.

Recent experience with the 707 has demonstrated (even more forcibly than did the DC-6 and Constellation over a decade ago) that pre-operational military flying does not necessarily ensure freedom from troubles in airline service. And herein lies the significance of that plate in the Douglas RB-66B's cockpit: it is not so much in large military orders for proven, off-the-shelf airliners that the U.S. industry's advantage lies; the American industry's real advantage lies in having a backlog of military orders for combat aircraft and missiles large enough to enable such projects as the DC-8, Electra, Convair 880 and 600 to be tackled without initial Government support. Missiles and military aircraft accounted for no less than 78.7 per cent of Douglas sales during the fiscal year 1958, with commercial sales making up the remaining 21.3 per cent, and it may well be that airliner orders will contribute an even smaller proportion to Douglas business in the future.

A less obvious but just as important point is that customers who order new airliners before they enter service do so because they feel that the competitive advantages to be gained from the new equipment, especially if it is jet- or turboprop-powered, are great enough to make the risk of revenue losses from early teething troubles well worth while. In other words, manufacturer and airline should have confidence in each other, particularly in the former's ability to produce the aircraft on time and in the latter's ability to operate them successfully. In this context it would appear that B.O.A.C. wants to have its cake and eat it—in the sense that the Corporation, by pressing so persistently for State aid, wants to have all the competitive advantages that such types as Britannias, Comets and VC10s can offer without any of the risks or penalties associated with the introduction of new and untried equipment.

## Lack of Confidence?

One feels that B.O.A.C.'s repeated requests for State payment of the pre-operational development costs of new British airliners not only does the British aircraft industry a grave disservice by showing a lack of confidence in it, but also diminishes the Corporation's own stature as an airline. For invocation of State aid tends to imply that the Corporation is not quite confident of having sufficient technical and commercial know-how to sponsor a new airliner unaided, and that it tends to regard itself as having been made, against its better judgment, into a sort of giant Flight Proving Unit for British airliners rather than an airline aiming to make a profit. Those sections of the current B.O.A.C. report dealing with this question speak of the Corporation's assistance to the industry, both in direct orders and in enhancing export possibilities. But is this entirely true?

However desirable State aid in this sphere may be from the short-term viewpoint, it will surely have unfortunate long-term effects, both psychological and political. The former will foster a shop-window approach to air transport, and prospective foreign customers are unlikely to take much interest in new British transport aeroplanes if they feel that these will automatically be ordered and operated by the Corporations regardless of commercial considerations, even if the aircraft have to be bulldozed into a commercially acceptable state by large-scale expenditure of Government money. It is very important to remember that it was the airlines, not the State, who have borne revenue losses from DC-6, Constellation and 707 troubles; surely this is one instance in which we would be wise to follow America's example.

The political effect of State aid in this field could be much worse than its bad psychological effect. This is because both Corporations would continually be under Government pressure to order and operate new types which they had not originally intended to acquire; and while this may not matter too much now it certainly will matter with a supersonic airliner. Supposing a decision is made to go ahead with a British aircraft of this type—and such a "go—no go" decision will have to be made fairly soon—then B.O.A.C. is bound to be the first operator. Yet if the Corporation feels that it is not strong enough financially to risk the razor-edge economics and great technical and operational problems of supersonic operation, is the Government to cancel the project, thereby wasting perhaps as much as £100m and making many workers redundant; or is it to compel B.O.A.C. to operate supersonically and make considerable losses? Neither solution will benefit the taxpayer, still less the industry; for if the latter's products are forever to be the subjects of political controversy, then confidence in them will dwindle. One can pay too heavy a price for State aid.

M. J. HARDY

# Christmas Bookshelf

**Sent Flying, by Bill Pegg. Macdonald and Co. Ltd., 16 Maddox Street, London, W.1. Price 21s. Illustrated.**

MUCH has been heard and written about Bill Pegg as chief test pilot of the Bristol Aeroplane Co. when it produced the Brabazon and the Britannia and he was responsible for the first flights of both aircraft. In this autobiography he tells a story that is not so well known: how he joined the R.A.F. at 15½ as an apprentice; how he became a flying instructor and after commissioning was posted to Martlesham Heath as a test pilot. All this is narrated in an unaffected and good-humoured style, and it is clear that Pegg's success as a pilot owes as much to his equability of temperament as to his flying skill. He says that in 31 years' flying he only once damaged an aircraft as a result of bad flying. No doubt there were many occasions on which he was lucky, as all test pilots deserve to be; and the episode of Britannia G-ALRX, which he describes in detail, was certainly a very narrow squeak.

One would like to have heard more about the earliest days of aircraft like the Blenheim and Beaufighter, which do not receive more than cursory references; but Pegg's tale of his R.A.F. flying experiences, with their informality compared with present-day controls and restrictions, makes interesting and amusing reading. The Brabazon story is interesting in another way: an episode in British aviation history for which Pegg, deservedly, had a front-row seat. H. W.

**Aircraft Annual 1960, edited by John W. R. Taylor. Price 10s 6d. Illustrated. Fleet Air Arm (in the abc series), by John W. R. Taylor. Price 2s 6d. Illustrated. Both published by Ian Allan Ltd., Craven House, Hampton Court, Surrey.**

NEXT year's *Aircraft Annual*, published in time for the Christmas stocking trade, is a miniature encyclopædia. In 15 chapters it covers many of the subjects which have been well publicized during the year—the closing of Croydon, and the work of the Blind Landing Experimental Unit, for instance—as well as more historical items, including the aircraft-carrying submarine M.2 which is thought to have been lost when the hangar doors were inadvertently opened under water.

The latest in the abc booklet series, on the Fleet Air Arm, carefully lists the aircraft used by the senior Service. There are more than 20, including half-forgotten ones like the Meteor TT.20, a target tug conversion of the Meteor NF.11 night-fighter. As noted above, both books are from Mr. Taylor's prolific pen. A. C. B.

**Man in Space: The U.S.A.F. Program for Developing the Spacecraft Crew, edited by Lt-Col. Kenneth F. Gantz. Duell, Sloan & Pearce, New York. Price $4. Illustrated.**

ONE answer to the question: "Why put Man in space?" is the oft-quoted observation that nowhere else can one obtain a self-maintaining computer with built-in judgment which can be mass-produced by unskilled labour. The performance and reactions of this self-maintaining computer under conditions approaching those of spaceflight are comprehensively dealt with in this book, which consists mainly of chapter-articles by U.S.A.F. officers and scientists which originally appeared in *Air University Quarterly Review*.

The chapters include Observations in High-altitude, Sealed-cabin Balloon Flight, by Lt-Col. David G. Simons; Weightlessness, by Dr. Siegfried J. Gerathewol; Biodynamics of Spaceflight, by Col. John P. Stapp; From Aviation Medicine to Space Medicine, by Dr. Hubertus Strughold; and Biomedical Aspects of Spaceflight, by Brig-Gen. Don Flickinger. Altogether a comprehensive and fascinating background handbook, supported by a bibliography and glossary of terms—plus a ten-page appendix on Project Mercury which comes almost as an afterthought. K. T. O.

**Taranto, by Don Newton and A. Cecil Hampshire. William Kimber & Co. Ltd., 46 Wilton Place, London, S.W.1. Price 25s. Illustrated.**

CAPTAIN DENIS BOYD faced the First Lord of the Admiralty, whose name happened to be Winston Churchill. Boyd had just been ordered to take over a desk in Whitehall. Instead he wanted to sink the Italian Fleet. "But I've been appointed to the *Illustrious*," he protested, and Churchill growled back at him: "You heard what I said." This was in the first few weeks of the Second World War, and Boyd's job at the Admiralty was to help beat the German magnetic mine. When *that* was done, Churchill promised him a moment later, he would see that Boyd got command of the aircraft-carrier *Illustrious*.

While the carrier was still being fitted out, Boyd and his officers found the answer to the new German mine, and at the end of January 1940 he went aboard his new ship, a vessel which was to become one of the most famous in the British Navy. A year later she was to be almost knocked out by a furious German and Italian air attack near Malta. But between those dates she was to win one of the most famous battle honours of all—Taranto.

This strike at the Italian Navy had been planned in 1938 aboard the carrier *Glorious*, laying then at Alexandria, and remained the most important commitment for the Fleet Air Arm through the last months of uneasy peace and in the first year of the war. It was an audacious operation in which a handful of pilots planned to bomb and torpedo a modern enemy battle fleet as it lay at anchor protected by hundreds of guns, barrage balloons and anti-torpedo nets. If those defences had worked properly the attack would have failed. But there were not enough barrage balloons, there were not enough torpedo nets, and the guns fired inaccurately. That was the setting when, on a bright moonlight night, a score of Swordfish biplanes with a top speed of about 130 m.p.h. changed the balance of sea power in the Mediterranean.

It was a glorious victory which bucked the Allies tremendously, stunned the Italians and more than annoyed the Germans. It clearly interested the Japanese, too, for a year later they imitated the British idea of fighting naval battles without the ships of either side seeing each other. And at Pearl Harbour they perhaps had an even greater success than the British Fleet Air Arm had at Taranto. It seemed as if the Americans had not even noticed the tactics of Taranto at all. A. C. B.

**The Crowded Sky, by Neville Duke and Edward Lanchbery. Cassell & Co. Ltd., 35 Red Lion Square, London, W.C.1. Price 30s. Illustrated.**

AN anthology, strictly speaking, is a collection of carefully chosen poems. It does not purport to be a history or even a record. What it should have is literary merit.

*The Crowded Sky* is indeed a rich collection of aviation gems; much of the verse is pleasing to the eye and to the ear, while some of the prose is itself sheer poetry. The air is one element where the pen has painted a finer picture than the brush; and the noblest work has come from a small band of professional aviators with the facility of expressing on paper the thoughts and emotions of the man in the sky and the world around him.

". . . Masses of cumulus cloud, majestic skyscapes, solid-looking rifts and ravines—strange and secret pathways in the chartless continents of the sky. Below, the land becomes an ordnance map, dim green and yellow, and across it go the lines, drawn anyhow, as a child might scrawl with a double pencil. The grim dividing lines! From the air robbed of all significance."

Thus wrote a fighter pilot of the First World War. No artist could convey it better.

Yet, though the authors of *The Crowded Sky* devote a large part of their work to "The Wings of War," the Battle of Britain might never have happened. In a work of this sort this might not be criticized as an historical omission, but it does leave a gap in contemporary literature. Surely "The Last Enemy" of Richard Hillary or "The Few" of Winston Churchill merited a place?

The commercial side of flying is, however, recorded in the matchless prose of Saint-Exupery; pioneering efforts in the personal stories of Charles Lindbergh, Kingsford-Smith, Lincoln Ellsworth and others. Gliding has its own chroniclers, and finally test flying is portrayed by British, American and German pilots.

Gaps there must be in a collection ranging from the balloon exploits of Leonardo da Vinci to the Bell X-2 flights of Col. Frank Everest, Jr. But this work by a notable aviation journalist and a former test pilot is a treasure chest which the reader will enjoy opening and dipping into again and again.

There are some intriguing revelations. From the *New York Journal* of July 26, 1896, we read of a Professor W. W. McEwen working on details for a rocket airliner 100ft long and 25ft wide to transport 50 people. Another item, from *Engineering* in the same year, talked of "automatic aerial torpedoes for conveying explosives to a given point"—an 1896 edition of the flying bomb.

Somewhere, it would seem, aviation lost its way. A. J. W.

**Space Age Dictionary, edited by C. McLaughlin. D. Van Nostrand Co. Ltd., 358 Kensington High Street, London, W.14. Price 45s. Illustrated.**

TECHNICAL text-books can be broadly divided into those which are authoritative, those which are authoritative but contain errors of fact or typography, and those which are not authoritative at all. This dictionary falls squarely into the third category. The Editor has had the assistance of numerous contributors, but it is hard to escape the conclusion that nobody concerned with the final draft can have been conversant with the subject dealt with. Not only does the reader who is so conversant rapidly lose all confidence in the work, but the actual choice of phrasing is frequently either ambiguous or downright incorrect.

It would be quite invidious to select particular examples of the weaknesses of this dictionary. Suffice to say that it is quite inadequate. It is particularly unfortunate to have to comment in such terms on a work from this publisher. D. Van Nostrand are renowned for technical dictionaries and encyclopædias; most of these are well known to the reviewer, who regards them as world standards, the authority of which cannot be challenged. Their *Dictionary of Guided Missiles and Space Flight*, for example, is of great value. The publishers would do well to produce a new *Space Age Dictionary*, starting with a clean sheet of paper. W. T. G.

# Developing the P.531

## SAUNDERS-ROE IMPROVE THEIR PROMISING FREE-TURBINE HELICOPTER

A DETAILED description of the Saunders-Roe P.531 helicopter appeared in *Flight* of August 8, 1958. Since that time the two prototypes have attracted considerable attention, and developments at Eastleigh during the last 15 months suggest that a review of the progress made is due.

A great deal of flying has been done on the prototypes (now known as P.531-0) since the first flight on July 20, 1958, and progress in both design and engineering development has been marked. This flying has involved engine and airframe handling, trials, performance testing, and assessment by Service and other pilots. Experience has, in general, amply confirmed both the philosophy and execution of the design. A considerable amount of ground running, before and since the first flight, has cleared these machines for operation at 325 s.h.p., the engine being the Blackburn Turmo 600.

The first development problem encountered was hunting of the engine/rotor speed governor, and most of the early flying was devoted to finding a cure. During this period a more satisfactory vertical tail configuration was also investigated, and a tail fin was added. Much early flight development was associated with the diagnosis and cure of peculiarities of behaviour in both pitch and yaw. As a result the tail rotor was moved to the opposite side of the boom and the horizontal tail area was increased. Some modification was also made to the tail-rotor control circuit. Worthwhile progress was made throughout; no serious difficulties arose and further prototypes were built with minor alterations.

Prototype P.531s are to be supplied to the Royal Navy for evaluation. The naval examples are fitted with skid undercarriages and incorporate various other detail modifications, but in other respects adhere to the normal prototype (Mk 0) standard in loading and power. In view of future rôles for these aircraft, it has also been thought advisable to fit the larger horizontal tail.

During its trials programme the P.531-0 proved to be a comfortable helicopter with low vibration levels. All normal flight manœuvres have been investigated, and results obtained are considered very satisfactory. Adequate control power is available over a wide working c.g. range, all anticipated operational loadings being covered without recourse to ballasting. The fully manual control system has proved to be quite as effective as that of the Skeeter, light and steady forces being experienced in combination with a high degree of manœuvrability.

Great interest is being shown in the P.531 by a variety of operators. Comment on all major aspects of the design has always been encouraging and has been a considerable stimulus to rapid development. Partly as a result of this, the whole airframe was redesigned in the 650 s.h.p. production version. Future P.531s will operate at this power, their performance in adverse altitude/climate combinations being decided by the development stage of the engine fitted (i.e., in effect, by the extent to which one-hour power exceeds 650 s.h.p. in I.S.A. sea level conditions, or alternatively, the maximum altitude in various temperature conditions at which the engine is able to develop this power for one hour).

Consistent with the increase to 650 h.p., and bearing in mind the potentialities of the aircraft and the probable requirements of interested operators, it was decided to make the production machine slightly larger, and increase the gross weight from 3,400 to 5,000 lb. Many modifications were incorporated and a skid undercarriage is now standard. General structural principles are unchanged, the most significant geometrical alterations being the extension of the fuel-tank bay to raise the internal capacity to 160 Imp. gal, and the revision of the forward portion of the cabin to accommodate more extensive instrument installations to customer requirements. It has been found more convenient to mount the enlarged tailplane (now standard) beneath the tail boom. The skid undercarriage has made it possible to discard the tailskid previously fitted.

*XN 333 is one of the Mk 0 aircraft at present being evaluated by the Royal Navy. They are powered by Blackburn Turmo 600 engines*

The layout of the aircraft permits a wide choice of powerplant. Development is at present proceeding with a Blackburn A.129, and a de Havilland Gnome has also been installed. With these two engines the transmission systems will be identical, except for the initial speed reduction in the primary gearbox. The final stage of the primary gearbox (27 : 72) is common to both, but a large difference in power output speeds (19,500 r.p.m. for the Gnome and 30,000 for the A.129), as well as conflicting directions of rotation, necessitate different primary-gearbox arrangements.

Output from this box is further reduced in the secondary box in two stages, the inter-stage drive being duplicated. The first reduction consists of one 18-tooth pinion on the intermediate drive-shaft meshing with two 31-tooth bevel gears mounted on radial quill shafts, the inner ends of which each carry a 16-tooth pinion. Both 16-tooth pinions mesh with a 50-tooth crown wheel at the base of the main rotor shaft. The P.531 will normally operate at rotor speeds of from 370 to 400 r.p.m., and rotor speed will be governed as on the Mk 0. For the A.129-powered machine the overall turbine/rotor gear ratio is 71.76 : 1.

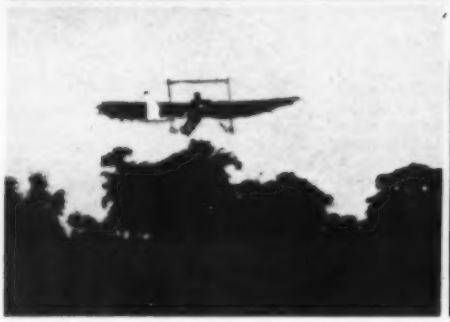
Main rotor controls follow standard Saunders-Roe practice, closely resembling the system used on the Mk 0 aircraft, with some modification at the secondary-gearbox mixing unit. The completely redesigned rotor hub, featuring a cruciform centre instead of the usual inset or female type, has stepped friction dampers and laminated torsion bars. It rotates anti-clockwise viewed from above, the opposite direction to the Mk 0. Also introduced is a hydraulic-disc rotor brake. Main-rotor blades are of wood covered with fibreglass. They are manufactured by Hordern-Richmond Ltd., and may be folded and stowed above the rear fuselage. The slightly enlarged tail rotor also has Hordern-Richmond blades, and is similar in construction to that employed on the Mk 0.

The P.531 carries fittings to equip it for a large number of different rôles: radio mountings, for liaison and reconnaissance; freight lashings for internal and external loads; armament racks for weapon carrying; two-stage amber for turbine training; stretcher racks for casualty evacuation; and a Lucas lightweight air-operated hoist for air/sea rescue. In addition, considerable work is also taking place in associated equipment, including such items as the autopilot/autostabilizer and the de-icing system. Ample stowage space for additional equipment is available in the fuselage behind the fuel tanks.

Saunders-Roe believe their P.531 to have outstanding merit, for by the time the customer takes delivery it will be one of the best-equipped and most highly developed aircraft for its size available. It is, in all respects of price, design and type of powerplant, convenient and economical, and it represents a significant addition both to the state of the pure helicopter art and to the equipment available to Service and other operators.

*G-APVI is the first production-type P.531 to fly; it is powered by a Blackburn A.129 derated to give a constant power of 650 s.h.p.*

# Sport and Business



*In the grounds of Stanford Hall, Rugby, this summer, a replica of the Pilcher Hawk glider was flown by Walter Neumark. The story of the flight which ended as shown in the lower right photograph is given by the pilot on this page*

THE BEST AND THIRSTIEST flying club in the world was the definition of Elstree Flying Club given at the annual dinner and dance last Friday by the secretary of its members' committee—and the occasion amply confirmed the opinion. Somehow, the 300 members conveyed the impression that club flying was not on the way out after all, and Elstree's parent company, Derby Aviation, was celebrating its 21st year of operations with some satisfaction.

Elstree is in fact thriving, with new airfield buildings, lighting, a control tower and radio soon to be installed. There are now more members than ever before and 50 have joined in the last three months. Under the dynamic leadership of David Ogilvy and his associates things are forging ahead. This is indeed as it should be. Even more heartening were the words of the guest of honour, M.o.A. Divisional Controller C. M. Colbeck, who stated that his Ministry was aware of and sympathetic to executive and private flying. New forces were abroad, he said; we were entering on a new and dynamic phase. The manufacturers would soon be obliged to produce suitable aircraft and small radios would also become available for them (Burndept are in fact doing this already). Small airfields would be opened to business aircraft, and Mr. Colbeck referred to "Things which will come by legislation." The operational prospects are a good deal brighter and the healthy position of Elstree Flying Club seems to indicate that the resources to take advantage of them are also available.

THE REPLICA OF THE PILCHER HAWK built by "Glider Doctor" Don Campbell for a B.B.C. television programme earlier this year is now for sale. As illustrated in the photographs above, this aircraft was flown by Walter Neumark of the Derbyshire and Lancashire Gliding Club in the grounds of Stanford Hall, near Rugby—scene of Percy Pilcher's original flights—but was damaged in a heavy landing after the third flight on July 18. A Pilcher museum is maintained at Stanford Hall by Lord Braye, whose father helped Pilcher in his 1895-1899 experiments.

Describing his 1959 experiments with the Hawk replica, Walter Neumark writes: "The method used for launching was a Pfeifer winch loaned by an R.A.F. Gliding Club and driven by Peter Mackenzie, assisted by Peter Gresham. It was extremely interesting to hear that Pilcher was also launched by a winch—a carthorse moving fairly slowly gave a fast launch by a pulley system.

"The leg take-offs were an unforgettable experience. One moment I was not only supporting 80 lb of glider by shoulder straps but also exerting a tremendous downward force on the handgrips to keep the heavy tail up. After a few steps the glider became lighter and my paces became longer—3 yd, 5 yd, 10 yd and then just an occasional kick.

"As in old fashioned solo glider training, the winch driver was supposed to control my height and keep me at about 3ft above the ground for the initial runs by varying the winch speed. After two low-level launches I was nearly certain that the c.g. was either too far back or the fixed tailplane too high, but decided on one more low glide before asking Don Campbell to move my position forward, add some lead to the nose and lower the tailplane.

"After floating at about 3ft for a hundred yards the airspeed suddenly increased. I did not release as my heavy ski-boots were already stretched out horizontally forwards in an effort to keep the nose down and it felt as if the aircraft would loop if the weight and tension of the wire were lost. Instead my call to stop was signalled to the winch. As the driver eased off, the nose shot up and the Hawk climbed steeply to about 20ft when Peter started pulling again in an attempt to "play" me down again. At that moment the left wing dropped badly and I had to swing my legs right over to right it. Lateral control by feet was slow but it did work, as several times the wing would drop either to the right or left and was successfully picked up.

"With Peter pulling again the Hawk flew level at 20ft. With my feet fully forward I could not lower the nose. Peter then slowed up and the Hawk climbed steeply again, flew level as Peter started pulling again, and finally climbed to about 35-40ft nearly over the winch. It was quite impossible to get the nose down, and I had to concentrate on keeping the machine level while "parachuting" down in a somewhat stalled condition."

*Record-breaker Max Conrad, seen together with extra fuel tanks in the cockpit of his Comanche on arrival at El Paso, Texas, after his 6,959-mile flight from Casablanca*

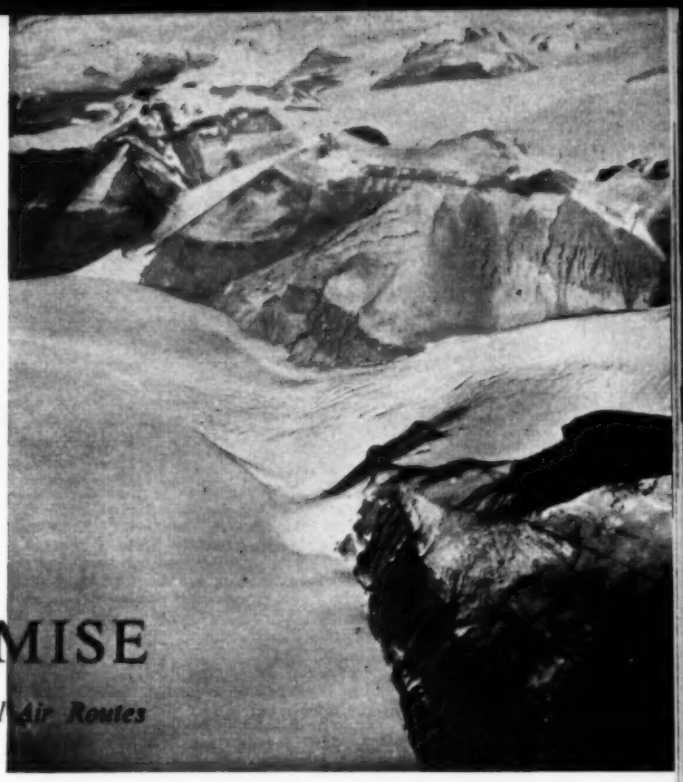
## RETROSPECT

***From "Flight" of December 18, 1909***

*Pictures from an Aeroplane in Flight:* On Monday, at Chalons, Mr. Latham successfully carried out the experiment of carrying a Pathé cinematograph operator and his machine, weighing 200 lbs. On the following day Mr. Latham made a journey over the surrounding country lasting seven minutes to enable the photographer to get a set of films from this unique view point.

DETAILS OF THE RECORD FLIGHT of 6,959 miles from Casablanca to El Paso, Texas, made by Max Conrad in a Piper Comanche last month, have been given by Piper Aircraft Corp. At a take-off weight of 3,838 lb—20 lb less than the maximum permitted weight for this class—the aircraft carried 370 gal of fuel, 60 gal of which were in the wing tanks and the remainder in four cabin tanks, one of which served as the pilot's seat.

Conrad reported that the flight was generally without incident. On the 3,700-mile leg to Trinidad he flew at an altitude of 100ft during the day and 500ft at night. His midway check-point at Piarco Airport, Trinidad, was reached 28 hr 21 min after leaving Casablanca. Because of forecast headwinds in the Caribbean and the Gulf of Mexico, Conrad abandoned his plan to fly past Jamaica and south of Cuba on a straight route to Texas, and headed instead towards Miami, climbing to 4,000ft over Haiti and steering well clear of Cuba. Later it became obvious that he could reach New Orleans and even farther. On landing at El Paso, Texas, 56 hr 26 min after take-off, the aircraft had 47 gal of fuel remaining. Overall fuel consumption during the flight averaged 5.8 gal/hr at an average ground speed of 127 m.p.h. Oil consumption was 4 quarts. Conrad himself carried no food, subsisting on three Thermos flasks of coffee, tea and hot water.



# ANTARCTIC PROMISE

## *Importance of the "Seventh Continent" for Civil Air Routes*

By ARTHUR SCHOLES, F.R.G.S.

THE vast gains made in weather research and high-altitude investigation during the International Geophysical Year and in subsequent months will unquestionably advance the date for the eventual inauguration of the first trans-Antarctic commercial air service. Enormous advantages will lie in the establishment of South Polar services, and one of the major countries to benefit it will be Australia.

The air distance via Antarctica from Sydney to Buenos Aires is 6,400 nautical miles, which is 2,000 miles less than a proposed direct route from Australia to South America via Tahiti. It will be less than half the distance of the present roundabout route from Sydney to Buenos Aires, through San Francisco, Mexico, and down South America.

Present airfields in Antarctica suitable for commercial use exist only in McMurdo Sound, the U.S. base in the Ross Sea area; at Wilkes, which has been taken over from the Americans by the Australians in the Australian Antarctic Territory; and at Mirny, the Russian headquarters, which is roughly 2,500 miles south-west of Perth, Western Australia. These airfields are now used for extensive supply and survey flights probing as far as 1,500 miles into the interior of the six-million square mile continent.

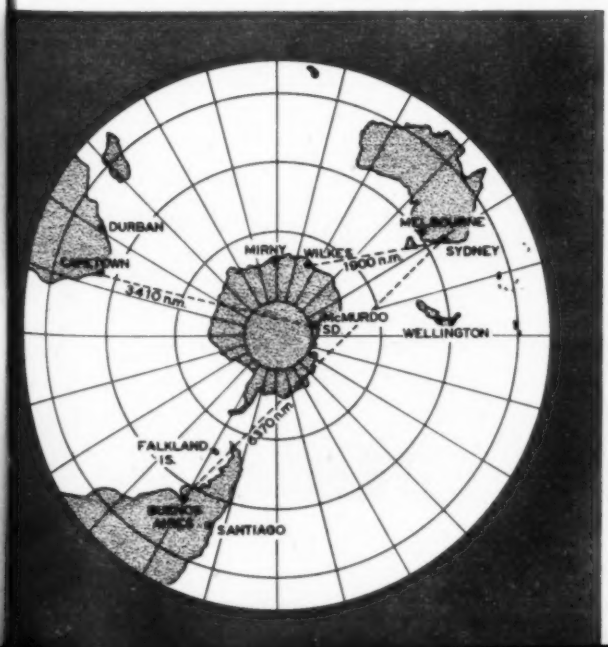
The Americans have three other inland strips, and the Russians have six, but these are only suitable for lightplane operations and could not be of any use in a commercial sense except as bases for rescue and weather services.

At Marble Point, 45 miles from McMurdo Base, the Americans have in mind a £20 million scheme for the construction of an all-weather airfield on the ice-free rock. Its establishment would hasten the advent of trans-Antarctic flights, but investigations are still proceeding.

Australia this year took steps to establish its own direct air link with Antarctica. The ice airfield at Wilkes will cost £1 million to complete, but the Government seems committed to the project because of the political and scientific implications involved.

Wilkes station, on Vincennes Bay, is 1,600 miles south-west of Hobart, or three hours' flight in a jet airliner. McMurdo Sound base is 2,800 miles south of Sydney, on the Ross Sea. The only other possible base in the Australian sector is at Mawson, 1,400 miles west of Wilkes. Both Wilkes and Mawson could become international airfields on a commercial route from Australia to South Africa via Antarctica. The route from Sydney to Capetown via Antarctica, about 6,000 n.m., would cut at least 1,650 miles off the present angular route across the Indian Ocean.

Establishment of a major airfield at Kerguelen, the French sub-Antarctic base 2,500 miles south-west of Perth, would enable a much shorter Perth - Johannesburg air service to be established. This route, running along the fiftieth parallel of south latitude, would be less than 5,000 n.m., and would save 1,200 miles from the existing Indian Ocean flight further north.




It is well known that the Australian Government will do its best to ensure that Qantas is one of the airlines operating in Antarctica. The assistant general manager, Captain G. Allan, said recently the corporation was ready to fly Super-G Constellation aircraft to Antarctica whenever the Government asked it, and provided the necessary facilities were available.

The Government last southern summer sent a parliamentary party to Antarctica to survey airfields. On return the leader of this group, Mr. W. C. Wentworth, M.P., urged that Australia should have big aircraft operating in Antarctica as early as possible.

The Russians and the Americans are well ahead of other countries in their experience of Antarctic flying. The Russians have a dozen aircraft, including multi-engined transports and large helicopters, based on Mirny. Their pilots regularly fly 1,500 miles into the inland to supply their advanced scientific-observation posts at Sovietskaya and at the "Pole of Inaccessibility." The Russians sought and were granted permission by the Australian Government to land at Perth, W.A., on their way to Antarctica during the recent I.G.Y., but for some reason this facility was never used. It has several times been reported that the Russians intend to fly Moscow - Mirny with their big jets.

During the south polar summers the Americans have for the past four years flown C-124s from Christchurch, N.Z., to McMurdo Sound, each carrying 40 tons of cargo or 90 men across the 2,200-mile route over the Southern Ocean. Operating from the 6,000ft ice runway at McMurdo, the U.S. crews have made parachute and supply drops to the South Pole weather station 800 miles inland. They have made many flights to their other bases on the Antarctica plateau and to the coastline of the Bellingshausen Sea, south of the west coast of South America. The Americans have been using helicopters, DC-4s, Otters, and Super Constellations in their operations.

Australia has lagged behind the two big powers in its air exploration of Antarctica despite the fact that in 1928 Sir Hubert Wilkins, an Australian, was the first man to fly in Antarctica—save for a forgotten balloonist who accompanied Scott's *Discovery* expedition in 1902. Australia has used Beaver and Auster ski-planes, flying from Mawson on local supply missions and surveys. But this type of work has also been done on a much larger scale by British expedition personnel in the Grahamland peninsula. Other nations such as France, Belgium and Norway have also come into the Antarctica air picture.

Commercial feelers have been made by all these nations interested in the future rôle of trans-Antarctic aviation. So far Pan American Airways has made the only commercial flight to Antarctica, using a Stratocruiser to fly to McMurdo Sound. Chile made a tourist flight over the Grahamland peninsula, and Argentina has flown military aircraft to her claimed territory in that region.

Canadian Pacific Airlines have also surveyed the South Pole

## ANTARCTIC PROMISE . . .

*The DHC-3 Otter operated by the Royal Air Force with the Trans-Antarctic Expedition last winter. The expedition also used an Auster*

route. They hope to extend their present Vancouver - Auckland service to South America via a trans-Antarctic route.

None of the present flying activity in Antarctica would have been possible without the slogging work on the trail by young explorers and by those who have experienced the hardships and loneliness of life at the Antarctic outstations. Flying in the Antarctic is full of hazard, and maintenance of mechanical equipment is always difficult. In sub-zero temperature metal sticks to the flesh like chewing gum to shoe leather. Equipment that operates on wheels is out of its element on the ice and snow-covered terrain. Most airfield equipment in Antarctica is mounted on runners. R.A.F. crews operating in Queen Maud Land in 1952 found that flying in the low temperatures and poor weather continually brought new problems. Taking off from the water in search of an ice quay, F/L. Tudor was disconcerted to find that the spray immediately froze on the floats of his Auster. The pilots found later that skis frozen to the ground could be released only by rocking the aircraft. To stop for a moment while taxiing was to take root on the spot. The ground-crews found the secret of working on small details of equipment with bare hands was to smother the hands in grease.

Navigation in Antarctica is a particular problem. Near the magnetic Pole an ordinary magnetic compass tries to indicate that south lies directly downwards. Alternatively, any direction is north when flying directly away from the Pole, or a complete turn could be flown round the Pole with the compass indicating always due east or west. The alternative is to use a very precise directional gyro synchronized with a magnetic compass well away from the Pole or aligned with an arbitrary grid overprinted on a map. Astro-navigation is also used to obtain positional fixes. The recent introduction of inertial navigation equipment has made polar navigation even more accurate and such equipment was used by the American nuclear-powered submarines which crossed the north polar regions under the ice.

But Antarctica is still a land largely without radio aids and recognizable ground objects, and with few maps. Radio aids have certainly increased remarkably in the last few years, but are still well below the international standards required by commercial aviation. Mapping of Antarctica is still under way, and the United Nations Special Committee for Antarctic Research, meeting recently in Canberra, drew up a scheme for a complete mapping of the whole continent. All this fundamental knowledge will have to be collected, processed and issued before scheduled flights across Antarctica become an accepted part of everyday communications.

Australia is expected to supply her Antarctic stations in a couple of years by direct flights from the Australian mainland. The R.A.A.F. recently acquired 12 Hercules transports from the United States. These big aircraft have already flown non-stop with men and equipment from Darwin, Northern Territory, to Butterworth, Malaya, and from Brisbane, Queensland, to Lae, New Guinea. The 2,500-mile flight from the Australian mainland to the Wilkes or Mawson stations would be well within their compass and would save weeks of needless sailing through the ice pack to reach the Antarctic continent. The Wilkes Air Terminal will probably be constructed by the R.A.A.F. Airfield Construction Squadron, which completed the bases at Darwin, Butterworth and Alice Springs.

Russia may be the largest air operator in Antarctica within 18 months. Apart from handing over one base to the Australians, the Americans handed over the Ellsworth base on the Filchner Ice Shelf to Argentina. Russia, meanwhile is sharing her bases with Poles and Czechs and hopes to become established in the Bellingshausen Sea area in the unexplored region south west of Grahamland. This area was air-explored on the eastern fringe by the South Australian, John Rymill, from 1935 to 1937.

Russian bases extend south from Mirny to Pioneerskaya, Vostok, Komsomolskaya and Sovietskaya. Two other bases have been established right at the most inaccessible points in the interior. The latter two bases lie on the route of the 3,000-mile trans-Antarctic expedition planned by the Russians for 1960.

It was fashionable to under-rate Soviet aviation a few years back, but today no one under-estimates Russian scientific achievement. In Antarctica the Russians have co-operated well in the I.G.Y. exchange of information and in rescue and search efforts, and have been friendly to all visitors to the camps. Their achievements and journeys have been made almost without any publicity. However, as they are operating in the Australian Antarctic territory, naturally the Australian Government has kept a weather eye on their activities.

Commercial air services across and to Antarctica are inevitable in a few years, for several reasons. First, there are the political implications involved. The Americans are very loth to let the Russians get ahead of them in scientific research, including aviation development. Second, Antarctica will never again be an uninhabited continent. It will always now maintain weather and radio stations. Third, there are prospects that Antarctica will be colonized for its mineral and oil reserves. Fourth, in the space age the continent might become the leading jump-off point for interplanetary travel.

It has been established that the radiation belt is most easily penetrable in the polar regions. As one who has been associated in a very small way with the peaceful and scientific penetration of the "seventh continent," I know it is the wish of all scientists of all nationalities that the future of Antarctica should be a peaceful one.

*A reconnaissance party leaving the U.S.S. "Edisto," one of the vessels of the American expedition in connection with the International Geophysical Year. The scene is the base at McMurdo Sound and the aircraft is one of the Otters used by the U.S. Air Force*

# Operation Rebuild

**B.O.A.C. BRITANNIA FLIGHT 931 AIRCRAFT G-ANBC OVERSHOT RUNWAY AT RANGOON 1410 HRS EIGHTH SEPTEMBER EXTENSIVE DAMAGE NO INJURIES**

THIS cable, from Bristol's Rangoon agent, arrived at Filton on a hot September afternoon last year. Britannia 102 G-ANBC is a well-proven aircraft. The first of the type to be certificated, it was delivered to B.O.A.C., together with another variant 102, on December 30, 1955, the first of 33 Britannias ordered by this operator. In September 1958 G-ANBC's total flying time was approaching 6,000 hr, some of this time, during proving flights, with the storm-warning radar being used to find rather than avoid storms and icing weather, but the majority on more peaceful revenue operation along African and Asian routes.

On September 8, 1958, the Britannia met trouble, information subsequent to the telegram indicating that it had run off the end of the Rangoon runway whilst landing, that the runway was wet due to drizzle, and that there was no technical fault in the aircraft. The 42 persons on board had disembarked within three minutes, vehicles of the alert airport crash services arriving on the scene within this time, although there was in fact no fire and no obstruction to passenger egress.

At Filton, structural repair specialists were put on a stand-by basis for immediate departure, but it was then decided that the owners would attend to initial requirements, conjointly with the usual accident enquiry.

**By N. H. WOOD, D.C.Ae.**
**(Service Department, Bristol Aircraft Ltd.)**

Damage to the aircraft, during the 100ft runway overshoot on to rough and muddy ground, was severe. The nose-gear radius-rod was broken, the leg folding unaccustomedly rearwards and forcing itself up through the front freight hold; but the main gear, following failure of the radius-rod locks, folded back in essentially the normal manner with minimum damage. The front fuselage forward of the crew door was split circumferentially, leaving only the top and upper starboard side skin and stringers intact though buckled. Other severe forward fuselage buckling and general asymmetry was evident, together with deformation of the flight-deck floor and of skins, frames and stringers along approximately 70ft of the lower fuselage aft of the circumferential split. In addition, the lower regions of both inner nacelles were crushed, the flaps were damaged and all four propellers were beyond repair as a result of severe ground impact. Engine damage was confined to the reduction gears.

Was repair of this severe damage an economical proposition, or would it be more realistic to reduce the aircraft to spares for the benefit of B.O.A.C.'s Britannia 102 and 312 fleet? The owners, their underwriters and Bristol Aircraft Ltd. had to give this matter careful and necessarily lengthy consideration—during which time the aircraft was lifted and moved under the supervision of B.O.A.C. personnel, ably helped by the underwriters' principal surveyor.

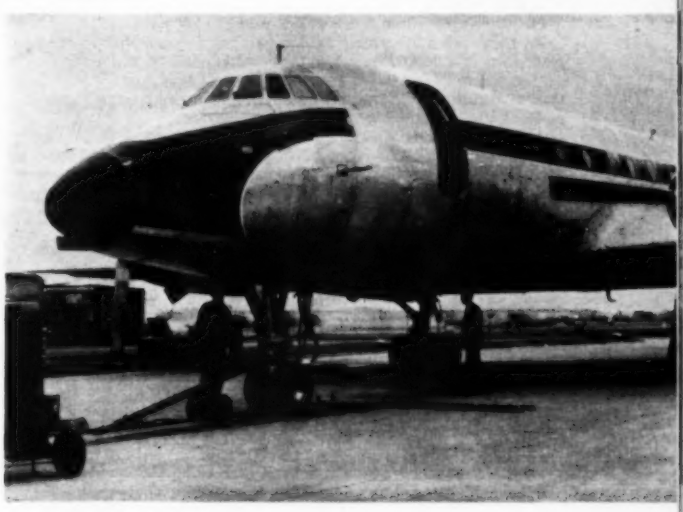
Lifting and moving the 82,500 lb (empty) airliner in its severely damaged condition was in fact a major operation, the strong suction of the mud on which it rested being an additional factor. Before lifting began, a makeshift road was constructed from the runway to the aircraft, using hardcore plus two layers of perforated steel planking at 90 deg to each other, with large sheets of boiler-plate to be moved around as required. Lifting equipment was, of course, also required; and after an intensive search by B.O.A.C. personnel a self-propelled high-capacity crane was brought some 25 miles to the airfield. Air-bags were flown in from London and Karachi, to supplement others loaned by the Burmese Air Force, together with track-jacks.

After removing the power plants to reduce weight an initial lift was provided by air bags positioned between the nacelles and under the outer wing panels, the crane being used primarily to maintain stability. Longitudinal balance was provided by ballast inside the forward fuselage, a tail support trolley being required primarily as a steady. Further elevation by means of judiciously positioned air bags then facilitated the positioning of track-jacks immediately outboard of the inner nacelles. At this point B.O.A.C. re-installed two engines, to achieve finer balance with maximum weight on the track-jacks for safety reasons. As suitable bull-dozers could not be located, the crane was then used to tow the aircraft back to the runway, outrigger booms providing a parallel

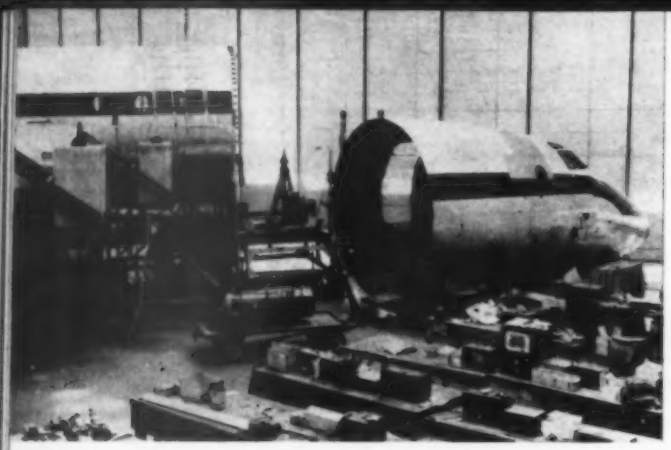
*These two pictures give some idea of the problems facing the salvage crew. The nosewheel was forced into the front freight hold*

pull on the cables attached to each track-jack. The whole operation, including turning the aircraft through 90 deg once on to firm ground, was necessarily a delicately co-ordinated task, made more difficult by frequent heavy rain. A complication arose when the track came off one jack during the turn, necessitating re-use of air bags to permit its replacement before towing to a hard-standing could be commenced. At the final hardstanding the aircraft was again raised to permit insertion of normal jacks and subsequent extension of the main undercarriage, locally manufactured weights being used to maintain balance in lieu of the powerplants. Dirty and disjointed (but with no further damage from the lifting and moving) the aircraft was then left under local supervision pending the outcome of decisions in faraway London and Bristol.

*[Continued overleaf*



*G-ANBC on return to Filton. Note the large area of temporarily replaced skin, as indicated by the interrupted cheatline*



runs, and repairs to the nacelles, had also reached completion.

In conjunction with Bristol, B.O.A.C. had meanwhile been organizing the supply of systems components from their own stores and those of the Bristol spares organization, via the Corporation's Britannia services through Rangoon. Replacement powerplants were also on their way from overseas holding points, whilst at Filton, the manufacture of a replacement front fuselage, 23ft long and the most complex part of the body, was well advanced.

On March 17, a long-range freight version of the Britannia (of the type in service with Transport Command) arrived at Rangoon from Filton with a replacement outer flap (some 30ft long by 6ft chord) propellers, undercarriages and pre-racked radio installations. Also on board were 16 systems specialists and a flight crew for the test flight and the journey back to England.

Following a satisfactory test flight on March 27, G-ANBC left Rangoon on March 28, exactly on the schedule agreed in Decem-

## OPERATION REBUILD . . .

*Above, permanent repair under way at Filton. Right, as good as new: the Britannia ready to resume service*

In early assessments the possibility of a write-off was high. An aircraft similarly damaged at a major airport was one thing; but this, with fewer facilities available, no hangar big enough and the next monsoon season likely to interfere with a complete on-site repair, was an entirely different proposition. However, further detailed consideration by a Bristol survey team, B.O.A.C. and the Survey Division of the British Aviation Insurance Co. (on behalf of underwriters) took a possible repair operation beyond back-of-envelope approximations. This was of course vital, since further inspection of the aircraft merely supported the initial appraisal that whereas it was a repairable proposition, it was clearly a situation where actual costs could easily exceed the level at which treatment as a "total loss less salvage" might have been more economic. Projects envisaged surface or air transportation of all necessary parts to Rangoon ("The front fuselage diameter [12ft] might just about fit a C-124 and we can carry everything else too—if we can hire one") and finally hardened-up as follows: (a) temporary fly-out repairs at Rangoon; (b) a nose-gear down, low-altitude (unpressurized) ferry flight to Filton; and (c) permanent repairs, including fitment of a new forward fuselage.

An agreement on this basis was drawn up last December, Bristol being responsible for all repairs on a fixed-price basis and with September 30 as the agreed date for re-acceptance by B.O.A.C.

On January 9 the operation got under way, with the departure from Filton of a 20-strong field repair team, plus equipment and materials, in a long-range Britannia. Included in the team was a senior stress engineer with extensive accident-survey and field repair experience. Some 30-odd repair drawings were produced at Rangoon, together with related calculations.

Asian weather is always a handicap to Europeans, but by early March the riveting of large cover-plates over the gaping hole in the fuselage was complete. The replacement nose oleo and twisted front fuselage were re-aligned, differential temperature-effects being equalized by facing the aircraft into the sun. By this time the fitment of external re-inforcing plates over the lower fuselage skins, re-alignment of the flight-deck floor and flying control

**"REBUILD" CALENDAR**

| Programme | Actual |
|---|---|
| Instructions to proceed, December 17, 1958. | Departure of first repair team, January 9, 1959. |
| Programmed date for completion of temporary repairs at Rangoon, March 31. | Actual date G-ANBC departed for Bristol, March 28. |
| Contract date for delivery back to operator, September 30. | Actual delivery date, August 20. |
| Revised B.O.A.C. programme for resumed operations, August 22. | Departure on service to Sydney, August 22. |

ber. The aircraft arrived at Filton on April 1 after a necessarily slower flight than that of the freight Britannia which preceeded it carrying the repair personnel and equipment.

At Filton the repair commitment was approached in the spirit which had typified the work at Rangoon. The new fuselage section was all but ready for fitment and for a short time G-ANBC looked like a noseless bomber, for the hole presented by removal of lower skins, frame segments and stringers over almost the entire length of the remaining fuselage resembled a cavernous weapons-bay. Interior soundproofing and the systems-installations, wing fillets and wing-joint bolts were, of course, removed to facilitate detailed inspections, whilst certain creased skin panels higher up the fuselage were replaced.

By arrangement with B.O.A.C., numerous modifications were embodied concurrently with the repairs. Nevertheless, G-ANBC was ready for test flight on August 12, although adverse weather plus the usual last-minute installational defects delayed this for a few days. The first test then took place on August 15, and the aircraft was fit to rejoin the other 31 B.O.A.C. Britannias on August 20. It resumed revenue operation two days later.

This repair, on an aeroplane which in terms of weight and dimensions can be included in the big three of the Western World's civil types, was the most extensive yet undertaken on a commercial aircraft by a British company, and even including the United States would be very near the top of any short list of commercial aircraft repair projects. Completion was achieved six weeks ahead of schedule.

## A PAINTER OF PROMISE

JOHN YALE is a name little known in Britain. He arrived here from his native Canada only in June, almost immediately suffered a broken hip, and has painted in a prolific way during his convalescence. His one-man exhibition of aviation pictures (he is a member of the Society of Aviation Artists) has just closed at the Royal Society of British Artists Galleries in London.

Mr. Yale works very quickly and paints thinly in oils with the minimum of preliminary sketching. He succeeds in capturing the feeling of the spacious sky by careful composition, a generally soft choice of colours, and by large canvasses, some 5ft×4ft. There is no attempt at detailed portraiture of aeroplanes: rather are they made to take their place correctly in the patterns of light, smoke and cloud. Farnborough 1959 figured largely in his catalogue of 23 works.

He has spent considerable time painting the DEWline radar installations in Northern Canada, and has visited Sweden as the guest of the Royal Swedish Air Force. At 34 years of age he is full of zest for his chosen subject, and merits careful watching.

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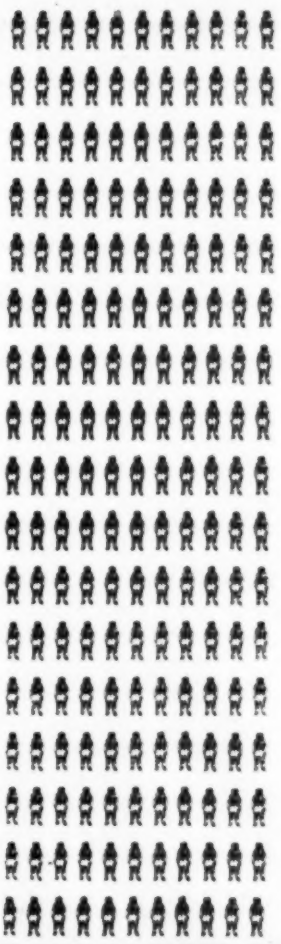
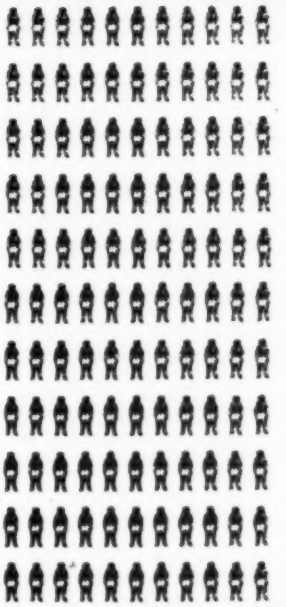


# TO DATE 308 LIVES SAVED BY MARTIN-BAKER EJECTION SEATS



**MARTIN-BAKER** *Aircraft Company Limited*

# Straight and Level

IN "The Gentle Jet" (*Flight*, December 11) Captain G. T. Greenhalgh, manager of B.E.A.'s Comet Flight, paid warm tribute to the assistance given to the Corporation by No. 216 Squadron R.A.F. (I believe, incidentally, that the Corporation presented the Commanding Officer with a model of the Comet 4B.) And Captain Greenhalgh suggested that "216 deserve great credit for the way they operate . . . quite a few airlines would be pleased to equal their performance."

But 216 Squadron "has no comment to make" on its assistance to B.E.A.'s Comet fleet. What a pity. This splendid example of co-operation between one of Britain's fighting services and one of Britain's national airlines must apparently remain a State secret. Here, surely, is one case where the maximum publicity could be made of Service money well spent and Service effort willingly devoted to the national cause.

● An American aviation safety officer, in an idle moment, has put into the language of the Red Indian what a maintenance engineer should do if a pilot reports that his jet engine is vibrating too much. Entitled *Injun Bulletin*, it contains the following sort of extracts:—

"If engine shake in sky and no shake on earth, get new flyboy; when get new flyboy, get big one to fill up seat tight so no shake from or in seat. Sometimes flyboy shaking because no trust engine. . . .

"If many flyboys say engine shake too much, maybe good idea see whatsamatta.

"Get ground boy sit in gunpowder chair [ejection seat] and work kerosene handles. When engine turning and shake like hell, stop and check whatsamatta.

"Number one for make engine shake is loose electric machine, tighten like devil.

"After whatsamatta check-up . . . take off hot pipe and count buckets on wheel. If fire wheel lose buckets, because flyboy work kerosene handle too fast. If engine "kafloom-kafloom" too many times, hot box and fire go to hell soon. If fire wheel good kind, go see whatsamatta air compressing wheel.

"Take-care flying machine men allatime lose tools in front air tunnel, makes compressing wheel heap sick, also make engine shake.

"Sometime ball bearing lose marbles and engine shake like hell. This because got-ready fly men don't pre-oil bearings.

"If ground boy no find whatsamatta, then call electric man with black box. Man with black box tell whether fire wheel shake or front end shimmy. Black box always tell truth whether flyboy or ground boy feel engine shake by seat or not. . . .

● From Ministry of Aviation Information Circular No. 113/59:

"In the meantime there should be no confusion with the wingbars of the V.G.P.I.s., which always appear either red or white in two positions up the runway from the threshold, as against the single position of the white fixed distance wing bars in association with threshold wing bars, which in future will always be green, except that white threshold wing bars may continue to be provided at some aerodromes where there are no other wing bars, either V.G.P.I. or fixed distance . . ."

Any questions?

● Another reader writes about "airplanes" v. "aeroplanes":—

"With regard to the note in Straight and Level of November 27 about the use of the word "airplane" by the *Sunday Express*, I had a similar bout with the Editor of the *Evening Standard*. No go—he informed me that it was "just editorial policy." The ghastly thing was its appearance in a piece about the R.F.C., written by an old S.E.5 pilot, and a cavalry colonel to boot!"

● From another reader comes this letter, which he came across as an "example" in an old Pitman's Shorthand text book:—

"Mr. Henry Canning,
Brighton.
Dear Sir,

We have your favour of the 11th, and in reply we have the pleasure to enclose herewith price list of our new 'Boston Flyer' air machine, a machine which is far in advance of any make we have yet sold. The cheap machine to which you refer is a foreign one, which we decline to keep in stock. We prefer to offer nothing but the best class. Our local agent is very often near your place, and we shall ask him to call upon you and explain more fully all we claim for the 'Boston Flyer.'

Respectfully yours, etc."

I asked the warden of Straight and Level's archives, Mr. Alfred Dust, what the Boston Flyer was, and he said he had never heard of it.

So much for the Boston Flyer. The despised foreign machine evidently saw it off, as these despised foreign machines have a cursed habit of doing.

● Twenty-six people on board a Piedmont DC-3 perished when their aircraft hit a mountain in Virginia on October 30. One person on board—just one—survived. Everyone said it was a miracle.

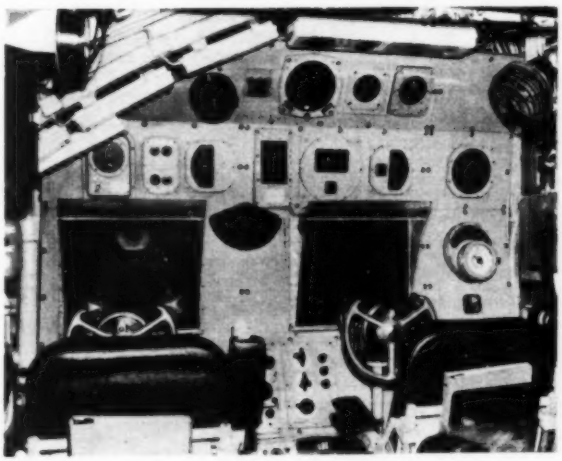
Four weeks later, on November 30, twenty-five people on board an Allegheny 2-0-2 perished when their aircraft hit a mountain in Pennsylvania. One person on board—just one—survived. Miracles, they say, never cease.

● *"Many have not been able to bear the spectacle without shedding tears; others have involuntarily lifted their suppliant hands to heaven, or fallen upon their knees; several have fainted, and at Lunardi's first ascent, a delicate female was so overcome by her feelings, that she died upon the spot."*

I found this glorious piece (about balloon ascents) in *The Panorama of Science*, dated 1849. One century later I discover in *Hansard* (November 27) that London Airport residents experience similar emotions when observing or hearing the take-off of the larger and heavier jet-propelled airliners.

● A colleague who recently returned from Moscow tells me he visited the Kremlin and found that "it wasn't at all like B.O.A.C.'s Headquarters building at London Airport."

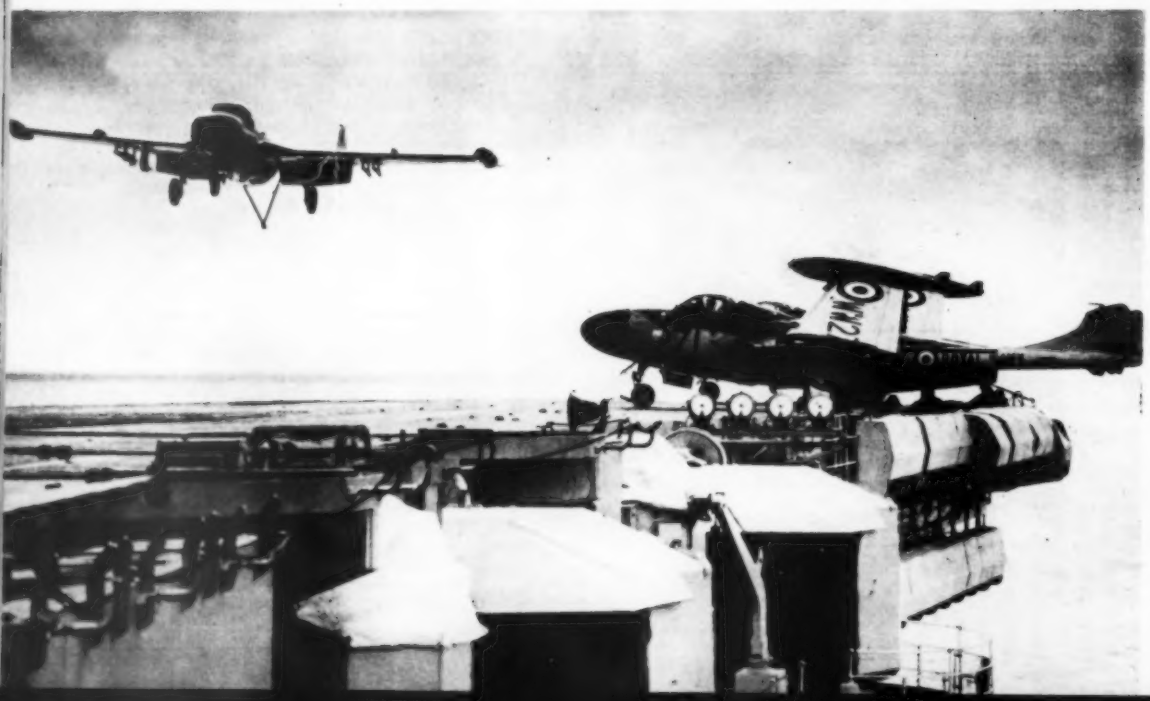
ROGER BACON

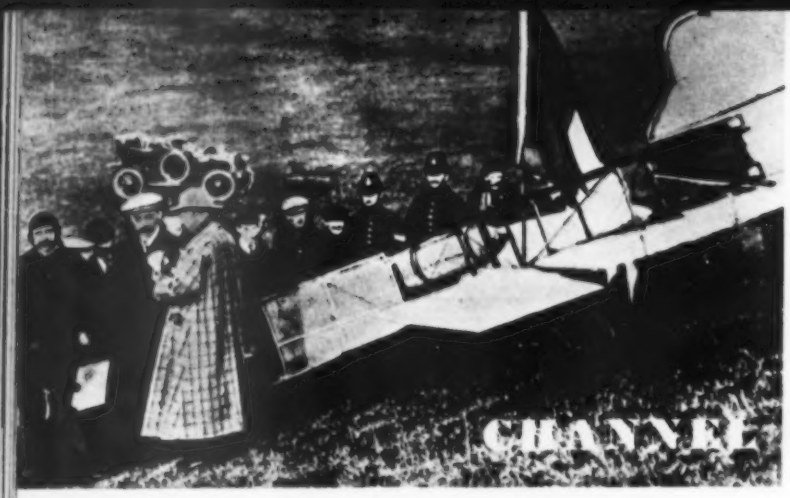


One of the instruments in this cockpit records "depth". Without this clue few might deduce that it is the "flight deck" of the nuclear-powered U.S.S. *Skipjack*, the world's fastest submarine. The vessel is capable of equalling the speed of the fastest surface craft for dozens of hours on end in the murky depths of the ocean, and she is said to be "hydrobatic". The control layout is the result of the U.S. Navy human engineering project SUBIC, Submarine Integrated Control

# 30,000 TONS OF SEA/AIR POWER

**PHOTOGENIC as film stars, aircraft carriers and their equipment make beautiful and striking studies under all the changing circumstances of light and cloud that give the sea its eternal variety. Here in these recent "Flight" photographs, "Victorious" is seen not as she appeared in our last week's issue, dressed overall for entering the Grand Harbour at Malta, but in full operational array. Above, one of the Scimitars of No. 803 Sqn. landing on; at left, the carrier's superstructure, with her Type 984 radar; below, a Sea Venom returning ("Victorious" has two squadrons of these aircraft, Nos. 831 and 893); and at right the 775ft-long vessel in magnificent plan view, showing her angled deck lifts and steam catapults.**






**AMONG the notable aviation events of the past year was the celebration of Louis Blériot's pioneer crossing of the English Channel fifty years before. Apart from formal ceremonies in France and England, the anniversary was marked by the series of speed contests between London and Paris organized by the "Daily Mail." In this article W. F. Bradley—a veteran journalist who was for over forty years Continental correspondent of our sister journal "The Autocar"—vividly recalls the 1909 scene in France; and his story is followed by two personal accounts by competitors in the 1959 race.**

*Louis Blériot's arrival on the Dover cliff-top aroused little interest; this small crowd soon dispersed*

# CROSSING, 1909

**BY W. F. BRADLEY**

OUT of a possible seven, there were three contestants in June 1909 for the first flight across the English Channel. In order of popular appreciation they were Hubert Latham with an Antoinette monoplane; Louis Blériot with a monoplane of his own design and construction; and Count de Lambert, chief pilot of the newly formed French Wright Company.

Thus when I received instructions from James Gordon Bennett, the eccentric multi-millionaire proprietor of the *New York Herald*, to proceed to the coast and stay there until the flight had either been accomplished or abandoned, I naturally attached myself to the Antoinette group. Indeed, there was not much choice, for although we knew that Blériot would attempt the flight, he had not then appeared on the scene, and although Count de Lambert had set up his starting rail near the beach at Wimereux we paid him a courtesy visit and then dismissed him as an unlikely starter. It was not until later in the year, when he flew round the summit of the Eiffel Tower, that we realized how far we had misjudged him.

The Antoinette team had installed itself at Sangatte, in the Hotel de la Plage, on the cliff side of the coastal road from Calais to Boulogne, where the ground rises towards Cap Gris Nez; and an abandoned factory, built by the over-enthusiastic French in the belief that the Channel tunnel was about to be bored, served as a support for the hangar.

The party comprised Latham, Léon Levavasseur, designer of both the aeroplane and the engine, a few mechanics, and newspaper men representing London, Paris and New York dailies. We lived together, took our meals around a common table, were convinced that Latham would be the first to fly the Channel and had a great respect for the genial Levavasseur.

In the few months he had devoted to flying Latham had shown extraordinary skill. Of independent means, he sought to add to the spice of life by intensive motoring, then took up flying and finally indulged in big-game hunting, in which sport he lost his life. When President Fallières, the most homely of all French presidents, turned to him with the remark: "Young man, what do you do when you are not flying?" the unexpected reply was, "Monsieur le Président, I am a *homme du monde*." And "man about town" correctly described him. He was elegant, cultured, affable but inclined to be sarcastic, and had no patience with shams or publicity-seeking adventurers.

Léon Levavasseur, rather below average height, rapidly putting on flesh, had a shaggy blond beard and merry blue eyes, wore clothes which had not been pressed and rarely brushed since the day they left the tailor's hands, and generally sported a peaked yachting cap. We had difficulty in suppressing a smile when he said curtly to his son: "Smarten yourself up, Jean."

A trained engineer, with experience in steam, electricity and naval construction, Levavasseur found a financial backer in M. Gastambide, and he built his first aeroplane and engine in 1903. But the financiers had greater faith in the motor car and obliged Levavasseur to devote most of his time to the development of his light-weight eight- and sixteen-cylinder engines; nevertheless, weighing only 5 lb per horsepower, they met with immense success in motor boats and were used by all the early flyers, including Farman for the first circular kilometre.

After dinner Levavasseur would enlighten our ignorance—for we "experts" were still woefully ignorant—on the theory of flying and carefully answer questions which would now appear absurd. He explained to us that for the aviator there was no wind. There were movements of masses of air in relation to the earth, just as there were currents in the ocean, but flying was possible under all conditions. Latham would take advantage of this to interject: "Well, Patron, why not let me start tomorrow?"

"But you might break the machine."

"Agreed, but I am paying for all breakages."

"But you might hurt yourself."

In view of such solicitude Latham did not press the matter any further.

Our routine was to rise at or before dawn and scrutinize the sky. Levavasseur would generally decide that there was too much wind or that atmospheric conditions would change before the English coast could be reached. We were then left free for the day, for it appeared to be an accepted rule that the flight could only be made in the calm of the morning. The evening frequently brought perfect visibility, the English coast standing out clearly under the setting sun, but no preparations were ever made for an evening flight.

It became evident that the great defect of the Antoinette organization was its lack of organization. One morning at the end of June the weather was so perfect that there was no reason for holding back. After a short warming-up flight everything seemed ready for the dash across the Channel; then the mechanics announced that there was not enough oil. My single-cylinder Sizaire & Naudin was standing by; I cranked the engine and dashed down the road towards Calais, aroused the first garage proprietor and drove back at my maximum of forty miles an hour with the can of lubricant. But in the meantime the wind had arisen and Levavasseur had decided that conditions were unsuitable. On a second occasion everything seemed ready; but this time the mechanics announced that the battery was dead and that no spare was available.

Each Sunday crowds gathered and stood around in the hope of a flight which we knew was most improbable. One afternoon a countryman who had come with his wife and children remarked in a voice which he intended should be heard: "This is the third time we have come here and nothing has happened. I believe this man Latham has the jitters."

Instantly Latham swung round and with a well directed uppercut sent the man sprawling. While madame was shrieking "Brute!" and the children were crying "Oh, Papa," Latham calmly lit a cigarette and remarked, "I'm not a showman. I never asked you to come here; now get out of my field."

At last perfect weather came—or, rather, Levavasseur decided that conditions were suitable. The commander of the destroyer *Escopette*, which had been standing by in Calais harbour, was informed that everything was in readiness, and he put out to sea early on the morning of Monday, July 12, first to point the way, then to follow the aeroplane. Hopes were high as the Antoinette

*Latham starting his second attempt to fly the Channel. This picture, and the two at the top of page 755, are from the author's album*

# Hi! faster with that feed!

As jet airliners get bigger, the more fuel they carry and the faster it needs to be fed in. At 200 of the world's airfields, Shell hydrant systems provide fast, safe fuelling for long-range airliners. The first hydrant systems were installed by Shell over 25 years ago, and in 1947, anticipating the demands of a new generation of long distance airliners for greater fuel uplifts, Shell commissioned the first large-scale hydrant fuelling installation. Since then, Shell Research has been constantly at work developing and perfecting hydrants. By the end of 1959 over 1,000 jet and prop-jet airliners are expected to be in service and the largest of them can carry up to 20,000 gallons of fuel. Modern Shell hydrant systems meet the needs of jet airliners of all types and are designed to fuel several of these aircraft simultaneously, delivering fuel to each aircraft as fast as it is wanted at speeds up to 1,000 gallons per minute per aircraft. In this way peak traffic demands will be met while keeping time on the ground to a minimum.

SHELL

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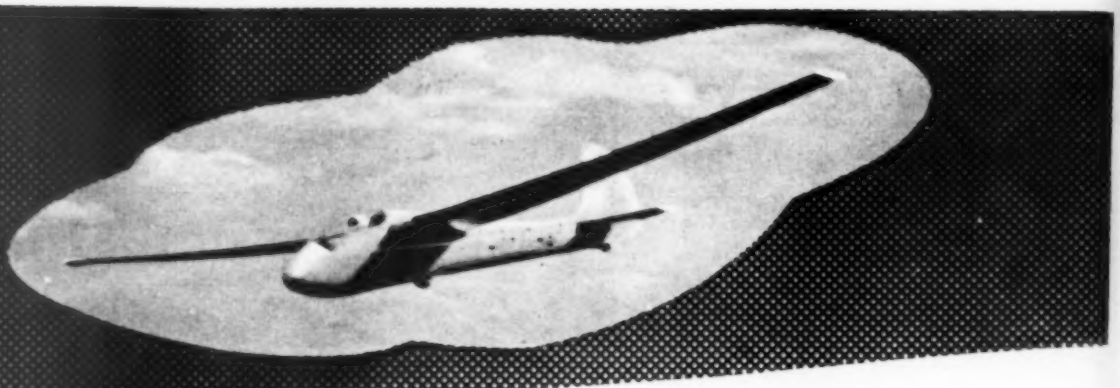

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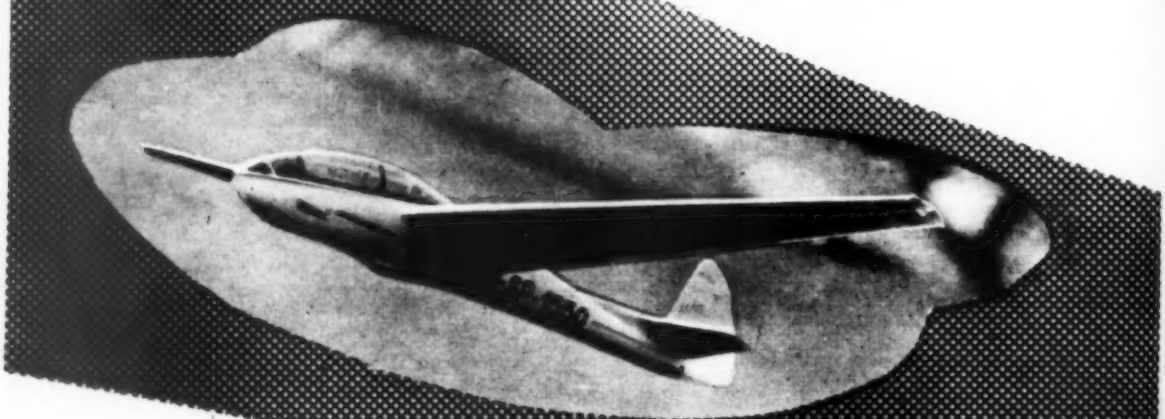

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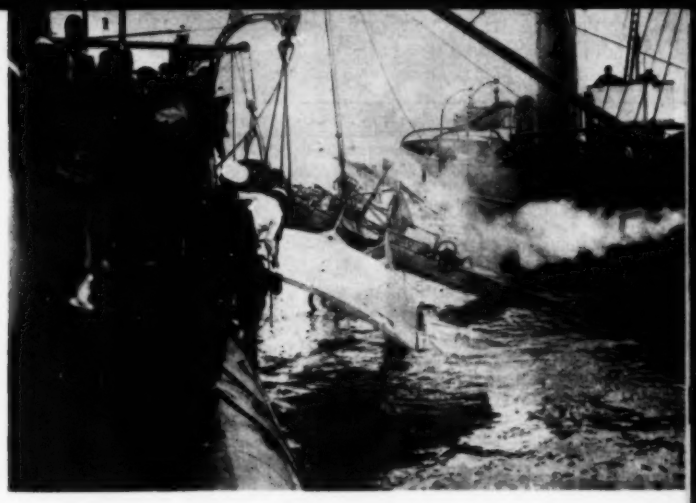


*Above, the author with Anzani, constructor of Blériot's three-cylinder engine. Right, Latham's Antoinette is salvaged from the Channel by the French destroyer "Escopette" and a tug*

## CHANNEL CROSSING, 1909 . . .

left the high cliffs and headed out to sea, the first flying machine in the world to appear over the strip of water separating France from England. Alas, our enthusiasm was short-lived. At less than half distance the engine failed and Latham came down on the water. He was picked up by the destroyer and his wrecked machine came back to Calais on the deck of a tug. With remarkable rapidity, compared with the leisurely procedure up to that time, a second aeroplane came from the works at Puteaux. It would have been appropriate for the flight to have been made on July Fourteenth, but on the French national fête day the flags were standing board-stiff in the wind and even Latham did not suggest that an attempt should be made.

Then Blériot appeared, bringing a Type XI machine, and accompanied as usual by Madame Blériot; by Alfred Leblanc, a balloonist who had taken over the duties of manager; Anzani, the maker of the engine; and a few mechanics. They installed themselves at Les Baraques, a small village at sea level a short distance outside Calais and less than two miles from the Antoinette headquarters. Still we remained faithful to Latham. Undoubtedly Blériot was the most experienced aviator of the period; he had given nine years of his life to flying, had drained £31,000 from his headlight business in order to continue his experiments, and had been officially recognized as the first man to fly a monoplane.

But he was nearly forty years of age, he had a growing family, and although his wife supported him loyally, she generally wept silently while he was aloft. Moreover, he was not altogether fit; he walked with difficulty, with the aid of a stick. This was the result of an injury suffered when he was flying the two-seater Type XII with E.N.V. engine. The exhaust-pipe lagging came adrift, and the pilot's leg was badly burned.

Early on the morning of Sunday, July 25, a wild despairing cry rang through the Hotel de la Plage—"Blériot's flown." After a few minutes of dismay, the idea came to race after him; but this was recognized as absurd and Latham completely broke down. Among we journalists the dominating feeling was one of anger —anger at our incorrect choice, at having missed the start of the greatest flying event the world had ever known. A few of us scurried down to Calais harbour and succeeded in getting aboard a second war-vessel just putting out to sea. The majority, however, had to wait prosaically for the regular cross-Channel boat.

What had happened was as follows. Some time before dawn Levavasseur had risen and decided that the weather was not suitable. At 2.30 a.m. Blériot and Leblanc studied the weather and decided that conditions would be satisfactory. There were no hesitations. Anzani was aroused and that irrepressible young man of thirty, who often acted like a boy of fifteen, brought everybody to action by running up and down the long corridors of the hotel firing his revolver. Anzani had received too long a training in the hard school of motor cycle racing to leave anything to chance. Petrol had been filtered, there was adequate oil supply, the battery was fully charged, ignition wires were tight, and he was confident that his three-cylinder motor-cycle-type engine of 100 mm by 150 mm bore and stroke, with its automatic inlet valves, splash lubrication, battery ignition and Grouvelle and Arquembourg carburettor would carry Blériot across the water to England.

Alfred Leblanc has never been given sufficient credit for his work in preparing the cross-Channel flight. Had he been attached to the Antoinette group it is certain the final results would have been different. A preliminary flight was made in the grey light (this was when Levavasseur, having come out a second time, saw the machine in the air and gave the alarm). Leblanc took charge of operations. At 4.30 it was daylight and clear, although as usual in the early morning the English coast was lost in the haze. Leblanc again helped Blériot to climb into the machine and handed his walking stick in after him. Over his tweed suit the aviator wore blue overalls, a wool-lined khaki jacket, and he had a motorist's racing cap on his head. Anzani brushed aside his mechanics and himself swung the 20 h.p. engine; at 4.35 Leblanc gave the signal; Blériot quickly climbed to about 250 feet and, having no compass, set off in pursuit of the destroyer *Escopette*, the pathfinder to England. A mere handful of people watched the take-off; the representatives of the big newspapers numbered two.

As a precaution, a friend of the family, a young Frenchman named Fournier, had been sent across the Channel in advance to find a landing ground and to signal it to Blériot by waving a huge French tricolor. Deceived by the destroyer's course, which had allowed for the ebb tide, Blériot pointed too far to the east, then had to fly along the coast until he sighted the flag on the North Fall Meadow and landed with minor damage to the undercarriage, 37 minutes after taking off.

When I stepped ashore from the regular Channel steamer I was amazed to find the town completely indifferent to the great exploit. The machine stood on the cliff, guarded by a policeman; but his presence seemed superfluous, for nobody was interested in the aeroplane from France. Dover was evidently determined that no visitor, no matter how unusual his method of arrival, should disturb its Sabbath calm. Only the Salvation Army band, playing to a handful of indifferent idlers, showed signs of life. The post office was closed but, I assured myself, the telegraph office would be open. I discovered it to find that the only line was monopolized by an enterprising London journalist who had given instructions for chapters from the Bible to be transmitted to his office (at Press rates) while he was preparing the story of his interview with the aviator.

Accompanying Blériot I returned to Calais, where the Bible was not being transmitted, and where the people were not indifferent, for the Légion d'Honneur was awaiting the great aviator and the enthusiasm of the crowds was boundless. With the

*"London . . . gave Blériot the welcome he deserved when he reappeared to receive the 'Daily Mail' prize"*

*This memorial, built in 1910 by the R.Ae.C. through the generosity of Mr. Alexander Duckham, marks the spot where Blériot landed*

**CHANNEL CROSSING, 1909 . . .**

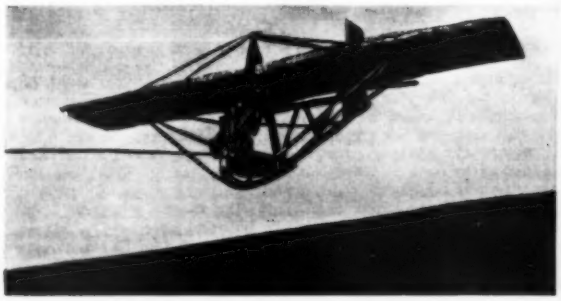
Monday morning papers, London—and, indeed, all England—awoke to the significance of this great exploit. They later gave Blériot the welcome he deserved when he reappeared to receive the *Daily Mail* prize.

Latham could afford to be indifferent to the money value of the prize, but he had set his heart on flying the Channel. Thus when Blériot returned to Paris to cope with the problem of supplying the great number of machines which had been ordered (at £400 each) his rival remained at Sangatte for another attempt.

The attempt was made in the early morning, just before the end of the month, but unfortunately was not much more successful than the first flight, for the Antoinette fell into the sea a few hundred yards from the English coast and the pilot was picked up and brought back to Calais by the *Escopette*. Latham decided to accept his second defeat. The great Rheims meeting was approaching, records were being broken almost daily, the pace was fast, and it appeared useless to continue in an attempt which would prove nothing.

# Channel Crossings, 1959

**THE "Daily Mail" race of last July was between Marble Arch, London, and the Arc de Triomphe, Paris. Although the fastest time between the two centres—40 min 44 sec—was set up by an R.A.F. officer, S/L. Charles Maughan, the achievements of two of the other entrants were particularly impressive. At one end of the speed scale Derek Piggott flew to Paris twice by glider—once in an open primary towed by a Messenger, and once in an Olympia 419 which he soared across the Channel; while among the high-speed contestants Cdr. Ian Martin, R.N., was the only one to pilot his own aircraft, a Scimitar F.1. These special articles by Piggott and Martin convey something of the contrast of these outstanding feats of airmanship.**



## *SLOW AND COLD*

**By DEREK PIGGOTT (Chief Flying Instructor, Lasham Gliding Centre)**

AS the scraping of the skid on the runway ceased and the ground dropped away all round me, I realized that this would be a flight to remember. There seemed no reason why the flight should fail, but very few people in gliding circles believed it was possible to go on an open primary glider to Paris.

The whole idea started when we were discussing ways of competing in the Blériot race just a few days before entries had to be submitted. A soaring flight seemed to offer very little hope of success because it could only be made in rather rare soaring conditions, but the idea of making the flight by aerotow on a primary was far more possible—and it would contrast well with the other faster methods of transport. Above all, modern air travel calls for very little determination and endurance, and such an attempt seemed to us to be in keeping with the pioneering spirit of Blériot. Furthermore, the primary with its unprotected seat and broomstick fuselage was almost the next best thing to the Blériot monoplane.

We planned to take our machine to Marble Arch on an open trailer and rig it for all to see before taking it by trailer to Blackbushe for take-off. We would land at a gliding site near Paris and then go on by trailer to the Arc de Triomphe, and so take the aircraft itself from Arch to Arc.

Unfortunately the Park authorities would not allow us to rig the glider at Marble Arch, but the sight of the primary on the trailer there made it clear to most people that this was no high-speed entry.

Henry Mackinnon had generously offered to provide the tow with his Miles Messenger. He was all ready by the time we reached Blackbushe with the primary, and we soon assembled wings, tail and the many wires which brace the rather flimsy looking wooden structure. The glider had been kindly lent to us by the manufacturers, Elliotts of Newbury, and was an EoN primary, similar in design to the German S.G.38 used for training the Hitler Youth in slides and hops. It was fitted with an airspeed indicator and altimeter in order to make aerotowing permissible.

Monday July 13 was not an ideal day for the attempt but was the only day Henry could take his holiday. The weather was unstable and turbulent and we all thought that it might prove impossible to keep control in such rough conditions. Bad weather on the preceding days had prevented an air test to find out whether a tow for even an hour was physically possible. All we knew was that above 60 m.p.h. the aileron control became marginal and that only very careful flying on the tug pilot's part could ensure keeping a low speed in bumpy conditions.

Signals had been arranged for me to tell Henry that the speed was too high; that all was well; or that he should find an airfield to land on as soon as possible. Periodically, and after any particularly rough patches, Henry's head would appear to see if I was still there.

We had arranged to make a circuit before leaving for Lympne so that I could release if there was anything wrong. I was anxious to get on and keen to avoid turning more than absolutely necessary, however, so I signalled thumbs up as soon as we were a few hundred feet up. Off we went, leaving Farnborough on our right and climbing to about 1,500ft on our way.

The 1¼ hr to Lympne went agonizingly slowly and it was not until we headed out across the sea over St. Margaret's Bay that the air was smooth enough to allow me to take one hand off the stick—only to discover that I could not reach my sweets or sandwiches because my harness was too tight. The sea going by 1,500ft below my feet caused me little concern, as I was wearing a Mae West. It was a pleasant relief to be in smooth air and to be able to take my eyes off the Messenger for a few seconds.

Half way over, a Silver City Car Ferry passed us on its way to Ferryfield and I burst out laughing at the thought of the pilot's probable comments. Then there was the welcome sight of land ahead, and a very bumpy stretch flying along the sandy beaches to Le Touquet.

After gliding down and landing clear of the runway in use, I was met by a fire tender and jeep which towed me to the Customs area. We picketed the glider down and went to calm the somewhat troubled controller who had only just received our flight plan and was surprised at the sight of our rather basic *planeur*.

Two hours later, refreshed by soft drinks and sandwiches, we took off for Beynes, a gliding centre west of Paris. The weather in France was a soaring pilot's dream, but the worst possible for aerotowing. Violent thermals and regular but small cumulus as far as the eye could see. Only the impossibility of landing safely in the woods below kept me from releasing and giving up just after take-off at Le Touquet. Both tug and glider were tossed about unmercifully but Henry kept the speed low and soon we were above the worst of the turbulence and safe again.

My impressions of France were mainly of vast areas of golden corn and of one or two stretches of forest which took rather a long time to pass below. Then in the distance I spotted the Eiffel Tower and the outskirts of Paris and, at last, the River Seine.

Unfortunately, Henry's navigation was too good at this point and with the nose of the Messenger high up in front of him we flew straight over the airfield of Les Mureaux without his seeing it. Unable to look at the map on my knee, I could see the airfield but did not know if it was the one we were to find before turning south on our route to the gliding site. The next (and a most enjoyable) ten minutes I spent watching the boats and scenery as we flew along the Seine towards Paris until Henry obtained a definite pinpoint and turned back for Beynes.

The landing at Beynes was uneventful but I am ashamed to say that I failed to land close to the hangar as I intended. Compared with a modern glider, the primary sinks like a brick and I was just too tired to judge the approach accurately.

The first person to greet me was a former girl pupil from

*Piggott and primary arrive in France—welcome by Gillian Horsfield*

*Sketches by Ferelyth Wills*

Lasham, followed by M. Heron, C.F.I. of the Gliding Centre, and Madame Be Abelanda, an enthusiastic glider pilot and interpreter. Most of the French club members seemed never to have seen a primary before and were highly amused. But with great generosity they had kept back their only truck and trailer for us in spite of their own glider pilots waiting almost 200 miles away at Nancy after a cross-country flight.

With everyone helping we soon had the glider dismantled and fitted on to the open trailer and off we went to the centre of Paris, tired but happy. It had been a battle of endurance, not of speed, and we didn't really care when we were told that someone had done the same trip in 47 min against our 11 hr 20 min.

Arriving back at Lasham after my flight to Paris in the primary I was confronted with the news that a Lasham glider had soared to Calais, proof that a soaring flight to Paris had been a possibility on that day. Critics were soon suggesting that I should have soared to Paris in a modern glider instead of being towed in the primary. I was the first to agree, but how could I have known that the weather would be suitable on even one of the ten days of the race?

My stiffness had scarcely worn off before good soaring conditions returned, with a not-unfavourable wind over France. Day after day went by with my frustration increasing. The weather was obviously possible but the expense and difficulty of a field landing in France if I failed to reach Paris made me put off my attempt. Finally I made up my mind to blow the expense and to make a try on one of the remaining days of the competition.

To my surprise the race stewards raised no objection to my changing the type of glider from the EoN primary to the EoN Olympia 419, the élite of British high-performance machines. This time the Messenger was to be piloted by Brian Masters, assistant C.F.I. at Lasham, and I planned to release just north of Deal with sufficient height to glide across the Channel and reach soaring conditions over France. A stable layer of air at about 6,000ft made it quite out of the question to soar across the Channel, and in any case it was doubtful whether soaring the 230 miles from Blackbushe to Paris was possible on any day without a strong following wind.

Once more the main consideration was to complete the course, and we took our time checking the weather carefully before take-off. Luck was with us and the forecast showed that soarable conditions should exist over France and that the flight was a possibility.

At 11.22 a.m., three hours after leaving Marble Arch, we took off for the release point at Deal. As we passed over the deserted gliding site of Detling and clear of the airways and control zone we started to climb, and at 12.55 I released at 8,800ft and turned out to sea towards Calais. This time I had the comfort and protection of a cabin and a gliding angle of over 35 : 1 instead of a thin nylon tow rope.

The air was absolutely stable and silky smooth and, gliding quietly along at 43 kt, I waited patiently for the first signs of the French coast. Thirty-two minutes later I crossed the coast just north of Cap Gris Nez at 4,300ft. Ahead I could see several haze layers and small cumulus clouds, and below me small ragged cumulus looking more like lifted sea fog than anything else. The cloud shadows indicated a surprisingly strong north-easterly wind, probably 20-30 kt, and I realized that I would have difficulty in getting inland to the better conditions. Soaring would be very marginal with such a wind and low cloudbase. A glance at the map showed that there was no airfield within reach and that I just had to stay up.

I floated down through the broken cloud, finding weak lift here and there. After losing several hundred feet in attempting to circle in a small patch of apparently strong lift, I resolved to force inland as far as I could and not to risk circling unless I was sure I would gain height.

The next 20 minutes were about the most exciting ever. The thought of a field landing without even a dictionary was enough to keep me going and eventually, after a few minutes of struggling below 1,000ft, the first sensible French thermal arrived. By 2.20 p.m. I was 2,500ft near Desvres with the cloudbase moving higher and the weather looking better every minute.

As I passed by a few miles to the east of Le Touquet, I knew that the Messenger was waiting there and hoping for no news of me. I was rather worried about the sea breeze effect along the coast, because I kept getting blown out towards the sea and finding myself under the last line of cumulus. Then as I approached Abbeville the sky suddenly cleared of cloud to the south in spite of the obviously wet ground below. This meant one of two things; either the air ahead was stable and unsoarable, or else the air had dried out so that no cloud was forming. I hung around gaining as much height as possible before striking out into the clear air in hope of another thermal. To my surprise, I found that conditions were far better and that invisible, dry thermals now went much higher.

I quickly increased my cruising speed to 65 kt and flew from town to town using only strong thermals and trying to get back on track. The main difficulty was map-reading as the visibility was down to a few miles in places.

At about 5.30 the haze began to cut off the heat of the sun, and the thermals became weaker and farther apart. The wind had become much lighter, probably a following wind of 5 kt, and I took out my gliding-angle scale and calculated that over 7,000ft of height would be needed to reach my goal at Beynes. I had to find several more thermals or fail, so I worked each thermal carefully and diverted to fly over every likely source.

If necessary I would land at Les Mureaux, and soon it was theoretically within range. A few miles north of Mantes-Gassicourt aerodrome the last real thermal took me to 5,300ft and I set off towards Beynes.

On my flight plan from Blackbushe I had declared Toussus-le-Noble as my destination because Beynes was a gliding site and had no Customs office. The rules of the race demanded the same route as declared and flown in the primary and I argued the pros and cons of annoying the Customs officials or of possible disqualification by the race stewards.

I was still undecided when I arrived near Beynes. A few miles away there was a large area of crops on fire and I joined another glider in the smoke and tried to gain some more height. After about ten minutes I realized that I was not winning and that I must head for Beynes immediately. I arrived with just enough height to turn in comfortably and land by the hangar at 6.40 p.m.

After a visit to the local gendarme to get my papers stamped we drove to the Arc de Triomphe at hair-raising speed to arrive just before the French speed aces. Our whole flight had probably been made on the amount of fuel that they had used to get their jets off the ground, and we were amused but not ashamed to compare our time of 12 hours with theirs of 45 minutes.

From release to landing I had flown over 155 miles in 5 hr 45 min—by no means a record, but a demonstration of the capabilities of a modern glider as a means of transport.

# *FAST AND HOT*

**By Cdr. IAN MARTIN, R.N. (Chief Tactical Instructor, Naval Air Fighter School, R.N.A.S. Lossiemouth)**

WHILE doing 70 m.p.h. on the pillion of a motor cycle in Paris traffic through successive crossroads of equal priority without slackening speed, it is probably best to close one's eyes and meditate on how one arrived in such an unfortunate predicament. This is not easy, but can come with practice.

We had realized at the outset that there would inevitably be time lost in the aircraft, as the pilot had to strap himself in before taking off. This loss was counteracted by the decided speed and acceleration advantage which the Scimitar had over other aircraft in the race. Furthermore the distance suited the Scimitar—it was the only fighter which could race without drop-tanks and still have a reasonable fuel reserve.

We decided that it was best to race only from Paris to London, to avoid language problems on the R/T and to have available proven homing aids in the event of poor visibility. Wisley was selected as the best airfield for several reasons. Firstly, being

## CHANNEL CROSSINGS, 1959 . . .

to the south-west of London the prevailing winds (which with typical contrariness did not blow) would assist the helicopter and give good visibility; secondly, the approved M.T.C.A. route from Wisley to Chelsea was almost straight, and one mile shorter than the doglegged route from Biggin Hill via Greenwich Reach, and finally, the valuable support of Vickers would be readily available.

Comparing a ten-second helicopter to Hunter rolling time from Villacoublay, via Biggin Hill, with a 45-second Scimitar rolling time via Wisley, we calculated that in still air we should have at least one minute in hand at Chelsea due to the Scimitar's speed advantage. The mythical prevailing south-westerlies would of course improve this by increasing the ground speed of the Wisley helicopter.

It was obvious that we had to devise a method of entering the cockpit with both engines running, and so we modified a gantry ladder to avoid the intakes which lie either side of the cockpit. With practice and careful arrangement of the cockpit we achieved a time of 24 sec for running 15 yd, climbing the ladder and strapping in. A further 10 sec was required to accelerate to full power. What we had not allowed for in our practice timing, however, was the state of breathlessness and mental dullness with which the pilot arrived for this evolution, and in fact our best helicopter to rolling time was 38 sec.

The Scimitar cockpit is too high to jump from; accordingly we designed a canvas slide which enabled the pilot to be on the ground, running, within 4 sec of wheels stop. On the first attempt this was rather badly bent due to my over-exuberance in jumping on to it. The Vickers design team greased their slide-rules and some rapid modifications stressed it to an adequate g-margin.

On Monday, July 13, the team moved to Paris, basing the aircraft at Villacoublay and themselves on the Champs-Elysées. We immediately encountered communication problems and, had it not been for the voluntary trojan efforts of Cdr. Pearson (Assistant Naval Attaché, Paris), Mrs. Pearson and Mr. Monty Norman (de Havilland, Paris) the Naval entry would have ground to a halt.

The first attempt was scheduled for Wednesday, July 15, before which a trial run from the control point in Avenue D'Iena to the heliport at Issy, a distance of approximately four miles, was arranged with M. Jean Gobar, a young French evening newspaper distributor. A route was agreed which avoided all but four traffic lights, and with some trepidation I climbed on to the pillion of Gobar's Golden Flash B.S.A. Mrs. Pearson having impressed upon M. Gobar the advantages of delivering his passenger in a fit state to fly a Scimitar, we set off on what later transpired to be a casual joyride, covering the four miles in heavyish traffic, with two traffic lights against us, in 4 min 31 sec.

Wednesday in Paris dawned fine and hot and the team left Paris by train for Villacoublay. The forecast for London was not particularly good for high-speed navigation, but we decided to go ahead as it was essential that we now tied together the loose ends of the various units down the route which had not yet functioned as a whole.

This, then, was the route and the provisionally calculated times:—

| From | To | Method | Time (min) | (sec) |
|---|---|---|---|---|
| Arc de Triomphe | Issy | French motor cycle ... ... | 5 | 00 |
| Motor cycle | Helicopter | 80 yards sprint ... ... | 0 | 15 |
| Issy | Villacoublay | Whirlwind ... ... ... | 3 | 30 |
| Helicopter | Scimitar | Strapping-in and Customs ... | 0 | 45 |
| Villacoublay | Wisley | Scimitar rolling to stop ... | 20 | 00 |
| Scimitar | Helicopter | Slide via Customs ... ... | 0 | 15 |
| Wisley | Lighter off Cadogan Pier | Whirlwind ... ... ... | 10 | 00 |
| Lighter | Cadogan Pier | Launch ... ... ... | 2 | 00 |
| Launch | Motor cycle | Sprint up Cadogan Pier ... | 0 | 15 |
| Cadogan Pier | Marble Arch | Royal Marines motor cycle ... | 5 | 00 |
| | | **Totals** ... | 47 | 00 |

*"The new method worked well . . ."—Cdr. Martin's Embankment arrival*

Watches were synchronized and H-hour passed to Admiralty, who alerted Cadogan Pier and Wisley. Sub-Lt. Aitchison (who was to start up the Scimitar, make the take-off checks and obtain take-off clearance) and I had a final dress rehearsal, after which I was taken to Issy. There I was met by Gobar and taken to the starting point.

This arrangement of meeting Gobar at Issy had an unfortunate sequel, for next day Lt-Cdr. Carter (Sea Vixen competitor) was to be met at the starting point, as there was no need for him as a passenger to check his aircraft at Villacoublay. Back at the starting point, on completion of his practice run with Lt-Cdr. Carter, it was explained to Gobar that he was to be *"ici, pas Issy"* on the next day. This little pun was greeted with roars of laughter and all left content that the point had been driven home. Unfortunately it was understood by Gobar as *"Issy, pas ici"* and as a result the first Vixen run had to be abandoned.

At the starting point there were crowds of photographers and pro-Naval well-wishers, including one lady who on the last day most charmingly presented a posy of flowers *"pour la femme."*

To avoid unnecessary fuel wastage in the Scimitar, which started up at H-hour, we decided that regardless of traffic the race must start at H-hour ± 30 sec, and so with one eye on the clock, the other on the traffic and a fist poised above the time clock, the moment was selected to punch the card, cram it into a pre-selected pocket and leap on to the back of the motorcycle.

For the final and fastest run on Sunday, June 19, Georges Houels, the French motor cycle champion, was my jockey. This run was most exhilarating and, due to his organization and popularity with the police, all the traffic lights were changed and bands of his friends guarded every crossroads. As a result of this, and light traffic, Issy was reached in 3 min.

The helicopter, piloted by Lt. Fournel, was a welcome sight as it quivered at take-off r.p.m. some 80 yd away, but an 80-yd sprint in a g-suit on a hot day left me gasping for breath. After a rolling dive into the cabin the three minutes before Villacoublay hove into sight was insufficient time to recover before it was "On oxygen mask" and poised for the next stage. Regardless of the physical distress caused by attempting to gasp through the oxygen tube it was essential that I put it on at this stage, otherwise it became entangled and obstructed the view when strapping in.

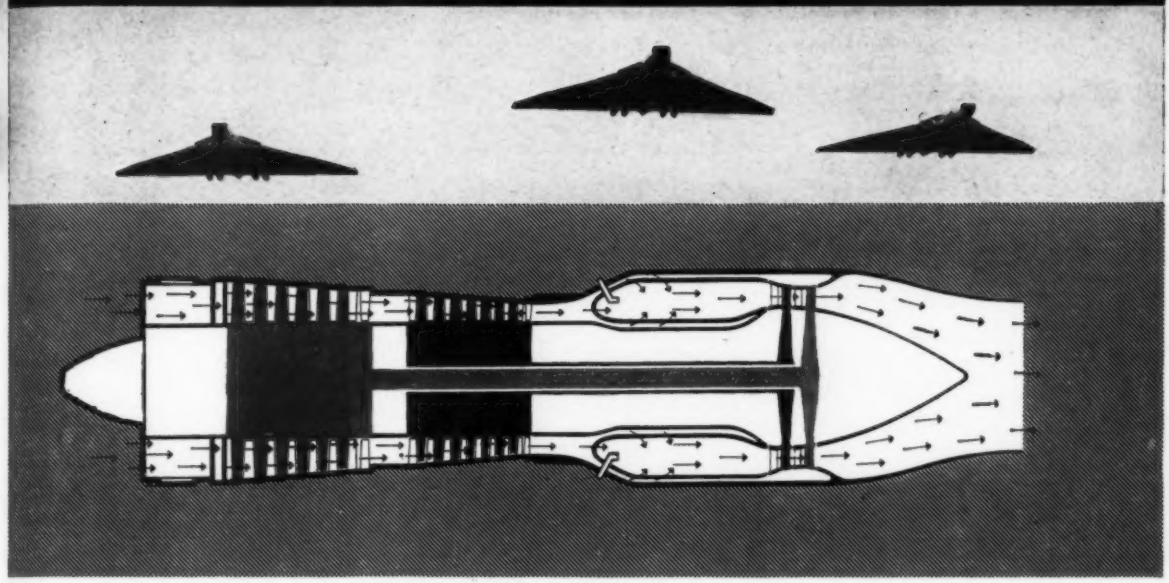
Followed closely by Lt. Stanley, the Whirlwind observer, who presented the passport for stamping, I climbed the ladder and, muttering to myself, "Left leg, right leg strap, right garter. Left garter, right shoulder, left shoulder strap," passed Sub-Lt. Aitchison who was crouched on the top. At pre-determined times during this drill Aitchison made the R/T and g-suit connections, handed in the passport, and then removed the ejection-seat pin which he threw over his shoulder as a signal to the ground crew to rush away the ladder, with himself clinging to the top of it while being battered by the slam acceleration of the jet blast.

For the next few minutes all actions had to be mechanical as my ability to reason was poor, probably due to the brain swinging wide on the Parisian corners. The Scimitar's acceleration is normally more than adequate, but the feeling of urgency was so great in these particular circumstances that a volley of imprecations were invariably hurled at the sluggish brute which required over a minute to achieve its racing speed from standstill.

With the aircraft at 2,000ft and throttled back, France slid rapidly beneath, and after the first run it was obvious that the D.R. positions had to be marked every minute, as the speed

*"A very dehydrated competitor hurled himself on to the slide . . ."*

Olympus turbojet – high power, low fuel consumption, superb handling qualities, great development potential . . .



# . . . ANOTHER ENGINEERING ADVANCE BY BRISTOL SIDDELEY

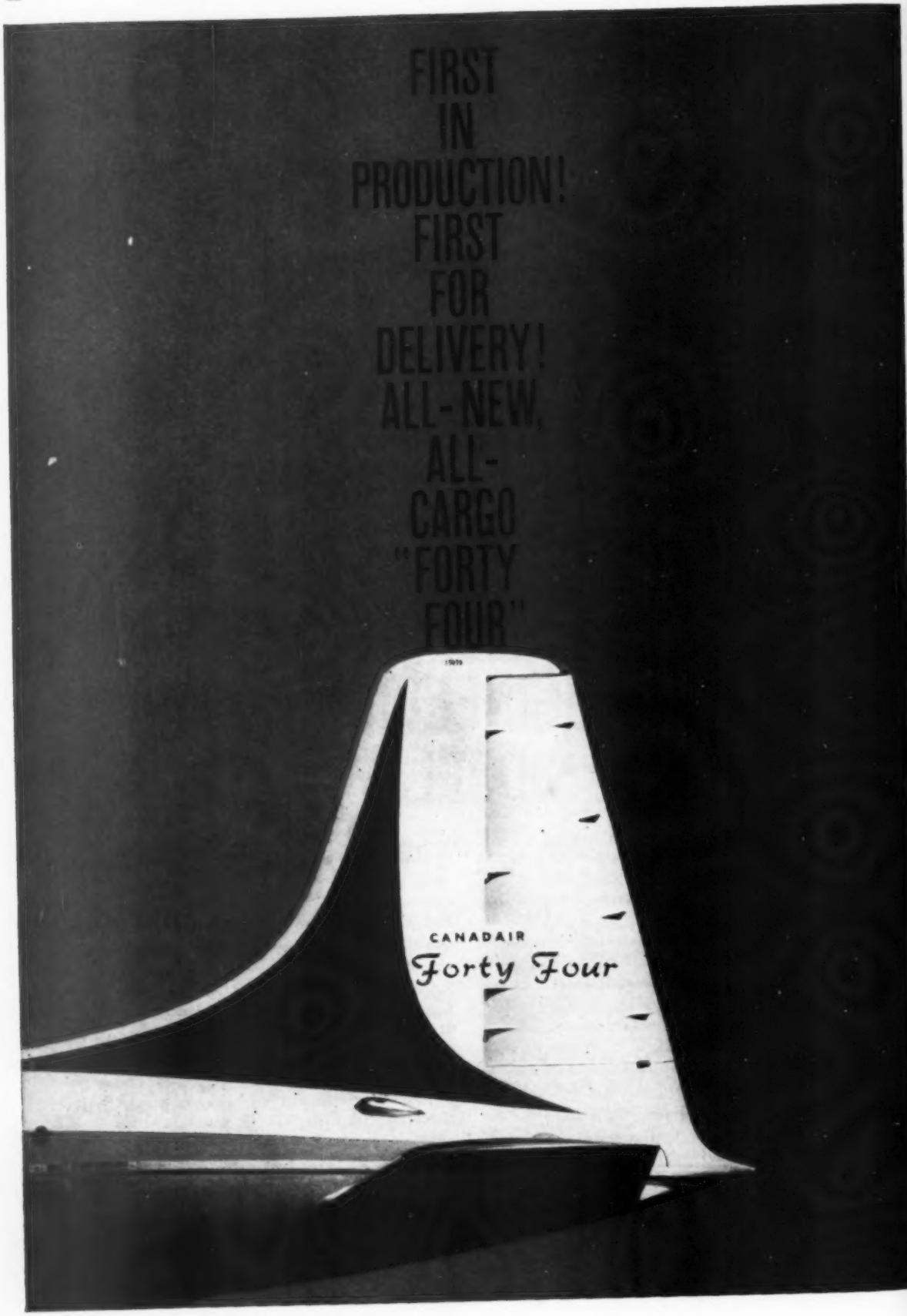
One of the largest manufacturers of motive power units in the world, Bristol Siddeley Engines Limited produce the Olympus. The Olympus is one of the most powerful and efficient high-thrust turbojets in service anywhere and therefore most performance details are security restricted. It can be said, however, that the Olympus possesses outstanding handling qualities. In a slam acceleration to full power from ground idling it considerably betters the official requirement. It also has one of the lowest specific fuel consumptions, and the highest thrust/weight ratio of any type-tested aero-engine in its class.

The Olympus owes its excellent all-round performance to the two-spool compressor system, pioneered by Bristol Siddeley and since adopted by the leading aero-engine producers in Britain and the USA. Proof of Olympus reliability is given by the fact that it already has the longest overhaul life of any British fighter or bomber powerplant. And the series has been proved to have enormous development potential. The first production version delivered 11,000-lb thrust dry, while the current engine reaches 17,000-lb thrust dry (24,000 lb with fully variable reheat). Even more advanced Olympus versions are rated at 33,000 lb with reheat.

**Olympus applications**

The Bristol Siddeley Olympus is ideally suited to operation at transonic and supersonic speeds. The Mark 201 gives the Avro Vulcan B 2 V-bomber an all-round performance unsurpassed by any other aircraft of its type. The Olympus has also been selected for the very advanced Vickers/English Electric TSR-2, the RAF's new tactical support/reconnaissance aircraft. Other Olympus versions are under active consideration for the next generation of civil airliners—the supersonic transports.

BRISTOL SIDDELEY ENGINES LIMITED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First photographs of the Canadair Forty Four, taken September 30, 1959 in Montreal. The "Forty Four" is now on the line for Seaboard and Western Airlines Inc., The Flying Tiger Lines and the Royal Canadian Air Force.

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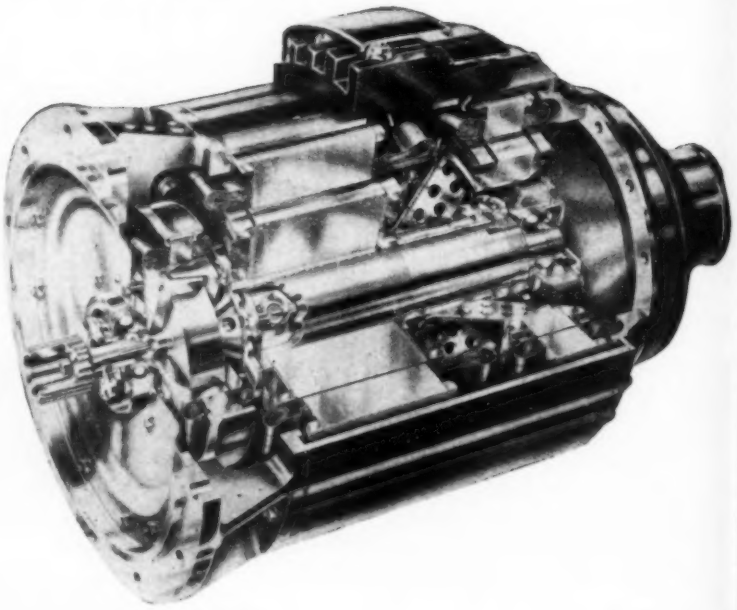
# 'Brushless' means 'trouble-free'

A.E.41

Abolishing the brush-gear on this English Electric AC Generator has brought about an altogether new order of reliability, life between overhauls and low maintenance costs. In conjunction with the Sundstrand constant-speed drive unit it has solved all the problems of efficient, economical and safe electrical systems for modern, high-altitude aircraft, civil or military.

The Alternator shown is the Type A.E.2043, giving 40 kVA for a weight of 86 lbs. It has a low synchronous impedance which, together with the integral excitation system, ensures that a high short-circuit current is available for fault clearing.



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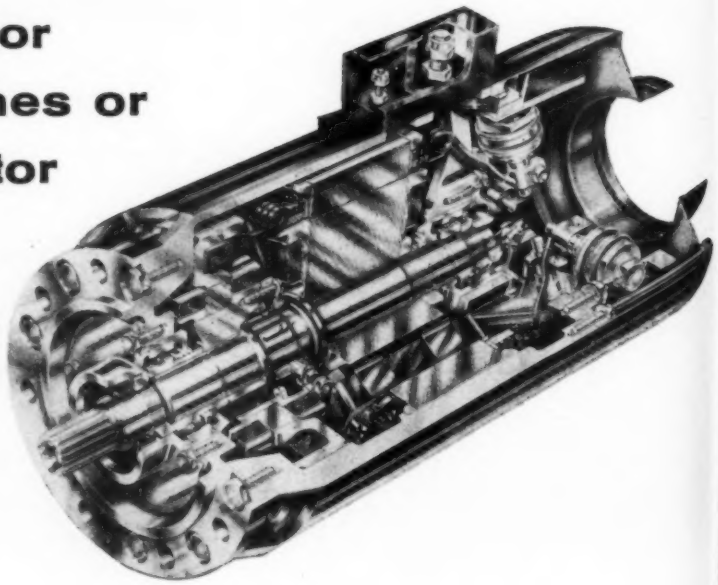
# A D.C. Generator without brushes or commutator

Following the success of the brushless A.C. Generator, English Electric have applied the same principles to the generation of D.C. current. The result is this Type AE 2514 Generator, with an output of 9 kw. at 30 volts over a speed range of 5000 to 9000 r.p.m., for a weight of 44 lbs.

Thus at last all high-altitude problems of commutation and brush wear are ended—for D.C. as well as for A.C. users.



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## CHANNEL CROSSINGS, 1959 . . .

allowed no time for a casual comparison of the countryside with the map. As Dieppe shot under the starboard wing it was possible for the first time to sit back and note with interest that dense condensation enveloped the wings and fuselage, and an accidental touch of the cockpit wall confirmed that the "thermal barrier" was no myth.

At Beachy Head the first position report was made to Wisley, whose controllers passed courses and ranges to me from Haywards Heath onwards. As Gatwick was passed the leg-restraint garters were released, the g-suit checked and height reduced to arrive at 1,000ft half-a-mile short of the airfield. At this point the throttles were closed, airbrakes extended, and the aircraft rolled into a 7 g 270 deg port turn which proved to be the fastest way of reducing speed for landing, being some 30 sec faster than a straight-in approach.

On finals the canopy was opened and at touchdown the port engine was stopped, so that the r.p.m. would have reduced sufficiently at the stopping point to allow a safe slide past the intake. To a cacophony of alarm bells and attention lights, as the aircraft's centralized warning system flashed the failure of ancillaries driven by the unwinding port engine, Maxarets were applied and harness released. As the aircraft squealed to a halt at the 1,400 yd mark the slide was hooked on to the port side of the cockpit and, with passport and Customs declaration form in hand, a very dehydrated competitor hurled himself on to the slide and, via the Customs officer, into the waiting Whirlwind. Here a most welcome Thermos flask of lime juice awaited me. Possibly because of "questions in the House" regarding expenditure, only water was provided for the final run.

Touching 118 kt the Whirlwind, piloted by Lt. Wales, thrashed at 1,000ft across Barnes Common and down the river to Albert Bridge, where he put it into a steep autorotational turn for a rapid flare on to the lighter. On the first run we had to use a mooring on the South Bank and so a motor boat was used to cross the river. The current was fast and our speed seemed pathetically slow. This was unacceptable for subsequent attempts and, while heavy metaphorical guns were brought to bear to obtain a berth as close as possible to Cadogan Pier, the Gunnery School at Whale Island was asked to rig a jackstay to save the time previously wasted running up the pier.

This new method worked well. A leap from the helicopter to the lighter, a second leap to the bows of the boat, three seconds to gather myself and then a leap to the trapeze, found me whipping across the water to the invigorating roar of what sounded like 40 gunnery instructors inviting a brawny team of sailors to get their so-and-so backs into it.

From a crumpled heap on the pavement it was a mere two paces to the pillion of Marine Hands' motor cycle. Via a carefully chosen route involving only Hyde Park Corner traffic lights we arrived at Marble Arch where, with shaking hands, the card was fumbled into the clock and stamped. The times for the three runs improved progressively from 46 min 58 sec to 43 min 58 sec and finally 43 min 11 sec, when we had to withdraw as the helicopters, their crews and the Royal Marines were otherwise committed.

Much later, when priority demands for adrenalin had ceased, a Senior Officer asked me if the race had been enjoyable. The reply was: "Yes, sir—particularly to look back on."

## RAMJET DEMONSTRATOR

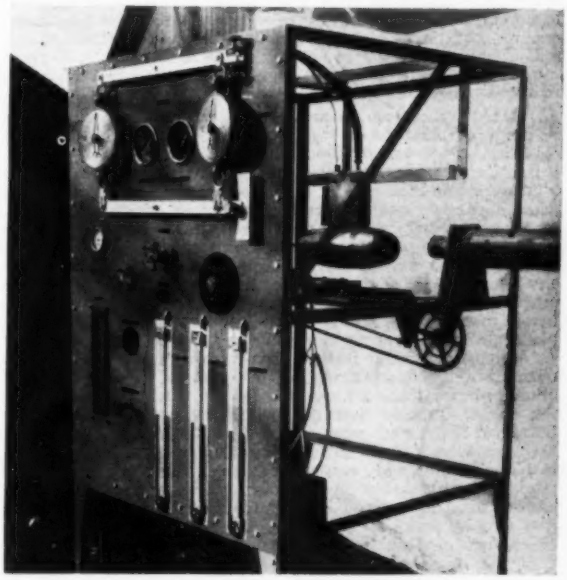
A HERTFORDSHIRE firm has recently started producing subsonic ramjet demonstration equipment for training aeronautical engineers and all those concerned with the principles of heat engines. One example has already been installed in the aeronautics laboratory of Imperial College, London University.

The equipment comprises a specially developed low-speed ramjet engine burning propane gas and operating at airspeeds below 300ft/sec. The fact that the compressor for the air supply requires a motor of only 8 h.p. should bring the equipment well within the capacity of the average engineering laboratory, and the basic principles, common to all heat engines, can be demonstrated—compression of air or gas, addition of heat through combustion, and the subsequent performance of work through an expansion process.

Layout of the components is so designed as to permit a water-cooled pitot static pressure probe to be passed right through the engine to produce a complete picture of the pressure variations taking place throughout the operating cycle. The equipment is said to be inexpensive to install and operate.

The engine itself has been developed from a unit used for experimental work on helicopter rotor tip propulsion, and the test stand has been designed specifically for educational work and to enable tests to be carried out under simulated flight conditions.

The firm responsible is P. A. Hilton & Co., of Sydneyville House, New Road, Radlett, Herts.



*This is the Hilton subsonic ramjet demonstrator, described in the text, of the type used in the aeronautical laboratory of Imperial College*

## ASHTRAY AIRCRAFT, ANCIENT AND MODERN

*Two of a range of ashtrays by the Wade group of potteries, Burslem and Stoke-on-Trent, well known for their vintage-car series. First designs show the 1903 Wright biplane, 1909 Blériot and 1919 Vickers Vimy (retailing at 3s 9d each) and the Comet, Britannia, Douglas DC-7C and Boeing 707 (2s 11d each; or packed in pairs, two British or two U.S. aircraft, 5s 6d per pair)*

## HOW TO READ AND WRITE

LIBRARIANS and others concerned with the dissemination of written information on guided weapons and aeronautics generally are invited to attend a course on this subject which will be held at the College of Aeronautics between January 6 and January 8. Assembling at 6 p.m. on the 6th, the course will spend the following morning hearing talks on loan and reference sources from Miss E. H. Ridler (M.o.A.) and Raymond Wall (A. V. Roe). In the afternoon F. V. Horsnell (M.o.A.) will discuss specifications, after which Mr. Cyril Cleverdon (College of Aeronautics Librarian) will deal with indexing.

On Friday, Frank Smith (R.Ae.S. Librarian) will speak on books, periodicals and unclassified reports, and Tom Aitchison (English Electric Aviation) will cover the same ground from the viewpoint of guided weapons. The afternoon will be devoted to a general discussion, with R. C. Wright (R.A.E.) in the chair.

The College of Aeronautics is situated at Cranfield, near Bedford. The fee for the course, including full accommodation, is £6 10s; application forms from T. Aitchison, Librarian, English Electric Aviation Ltd., Luton, Beds, or from F. H. Smith, Royal Aeronautical Society, 4 Hamilton Place, London, W.1.

# Correspondence

*The Editor of "Flight" is not necessarily in agreement with the views expressed by correspondents in these columns. Names and addresses of writers, not for publication in detail, must in all cases accompany letters.*

### Comet Demonstrations—By a Passenger

I WAS surprised at the letter from a South African reader [*Flight*, December 4] about B.O.A.C.'s demonstration of the Comet 4. These were certainly not my impressions of the way that the demonstrations were organized. Personally I did not hear any complaints or criticisms, either from people who were on the flight with me, from other people I knew, nor indeed from anything in the daily papers thereafter. All the B.O.A.C. staff were more than courteous, both on the ground and in the air. The pilot took the trouble to tell us quite a lot about the aircraft and what was going on and we had a perfectly delightful run to East London and back. We were often over ten-tenths cloud, but I do not think anyone was very interested in the ground anyway.

The aircraft was scrupulously clean inside and out and the only trouble the crew had was in getting the undercarriage up after take-off, although nobody knew about this until they read it in the paper next day—but I did wonder why the pilot left the flaps down for such a long time. Was there some connection?

Several remarks were passed about the noise of the air conditioning/pressurizing equipment. I must admit that it was a bit on the noisy side, almost as if something was slightly out of balance in one of the motors or fans. The only other criticism I can make is about the ashtrays on the arm rests. They are perfectly placed for covering your coat or shirtsleeves in cigarette ash every time you rest your arm on them. Otherwise I can only confirm that the occasion was well handled and organized.

Durban. A. E. GUY.

### More Limb-stretching

PERHAPS the more eccentric among your readers would like the very latest news from the First Flight Claims Front. (1) I have at last got my hands on a translation of the post-Stalin Russian article on Mozhaiski which appeared in *Voprosy Istorii* ("Questions of History") in 1956. It flays the Stalin-era authors who "ascribe to our compatriots inventions which were really made abroad" and the publication of so-called eyewitness accounts of Mozhaiski's tests: "an investigation, carried out by a special commission, showed that the 'eyewitnesses' of the flight never saw any tests. In 1882 some of them were two or three years old, and others had not even been born. Both the date and the name of the heroic mechanic (Golubev) who was daring enough to test the plane, proved to be fabrications."

Mozhaiski's machine does, however, appear to have been tested, but it was in 1884 (not 1882): what happened is still obscure, but I think we can assume (until further notice) that the machine took off down an inclined ramp as previously said. Sustained flight was certainly never demonstrated.

(2) No further signal has been received from the Pearse salient in New Zealand, and every week's delay in meeting the points I raised must inevitably increase our suspicions; those suspicions are deepened by my now hearing from the Library of Congress that they can trace no reference (as the Pearseans claim) in the *Scientific American*, or anywhere else over there.

(3) We must be grateful for the new boy introduced into the school by Mr. Meos (Correspondence, *Flight*, December 4), and we regret, with him, that no further details are available about Grishkavichus. I think we can sleep peacefully, however, in view of the "mixture of air balloon, flapping wings and wheels" along with the steam engine. Although the first date is 1851 (presumably referring to a previous year), and the second 1855, we have no reason to believe he ever dispensed with the balloon. He would almost certainly have got the idea from the much publicized attempts to fly by Jacob Degen (1806-17) who suspended his ornithopter beneath a balloon; from F. D. Artingstall's steam-powered ornithopter model which flapped itself furiously to pieces about 1830; and from Henson's published designs (1843) for his *Aerial Steam Carriage* with its tricycle landing gear.

(4) I have had many kind letters about my grandfather. I have had to take my aunt to a psychiatrist, as her failing memory seems to have got my grandfather confused with someone for whom she had harboured a guilty schoolgirl passion, and who is referred to cryptically in her last letter as Sir H—— M——. I can only imagine this must refer to an old family friend, the late Sir Henry Marriott, the author of a classic treatise on "Limb-stretching in Orthopaedics," but of whose interest in aeronautics I was unaware.

London, W.1. CHARLES H. GIBBS-SMITH.

### Preserving a Sunderland

I AM launching a campaign to obtain and preserve a Sunderland in good condition. Your readers will appreciate better than most people what we owe to this wonderful aircraft. Permanently beached in Britain, she would be a lasting memorial to the work of her gallant crews and evidence of the excellence of British flying-boat design and construction. More than that, on view to the public, she would be a source of revenue to Service charities, as well as paying for her upkeep.

The only Sunderlands left are those with the Royal New Zealand Air Force. When their service is ended, and with the help and co-operation of the New Zealand Government, one could be flown back to Britain and beached somewhere. If she were brought to Pembroke Dock a team of helpers would be ready to look after her when she had been brought ashore. Doubtless, there will be such willing enthusiasts in other parts of the country.

Cost of the flight home is put at about £15,000 when all aspects of staging, etc., are considered. I have had expert advice on this. The amount, upon consideration, represents one pound each from the population of one fairly small British town. When we consider the numbers of people all over Britain with special reasons for remembering the Sunderland—those who built her, flew her, serviced her, lived near her bases and, on board ship, sailed under her protection, the figure can be more optimistically viewed. Add to these the countless numbers with no direct connection but who had great affection for the grand old aircraft and, if only a proportion sent in contributions, the amount per individual would be very small indeed.

I appeal for letters and cards [address: Pantgwyn, Cardigan, Wales] promising support. If the response is sufficient to this *last chance* to save a Sunderland, a fund can be set up and contributions sent in.

Pantgwyn, Cardigan. PETER THOMAS.

### Commercial Pilot Training

WE consider that during the past three years we have made a significant contribution to the training of commercial pilots, and by the most careful planning it has even been possible to reduce the cost of the course for the commercial pilot's licence by £20 in future. This is in spite of the fact that all our full-time instructors have commercial pilot's licences and full instructor's ratings, while between us we have over 30,000 hours' total flying experience.

We feel that candidates for commercial pilot training who are unable to afford the training offered at the proposed State school can take heart from the fact that there are other and less expensive avenues by which a career as a pilot in civil aviation can be approached.

Exeter, Devon. EXETER AIRPORT LTD.,
PLYMOUTH AIRPORT LTD.,
R. J. B. Pearse, Managing Director.

## HISTORICAL RECORDS WANTED

A COLLECTION of records and souvenirs pertaining to the history of aviation is being made by the Royal Aero Club and contributions will be gratefully received. The club, which already has some excellent material, is primarily interested in matter concerning pioneers, historic flights, records and sporting events. (Technical and scientific material is being collected by the R.Ae.S. and any presented to the Royal Aero Club will be passed on.)

Items of any date, and ranging from photographs and newspaper cuttings to programmes of flying meetings, dinner menus and old aeronautical books, will be welcome and should be sent to the Honorary Secretary-General, Royal Aero Club, 119 Piccadilly, London, W.1. The club point out that there is a particular shortage of material for the 1919-38 period, and emphasizes the future value of this library of historical records which contributions will help to establish.

## FORTHCOMING EVENTS

| | | |
|---|---|---|
| Dec. | 29. | Institute of Transport (West Middlesex Group): "Work of the Federal Aviation Agency," by Thomas H. Carter. |
| Dec. | 31. | The Science Museum: "The Story of Flight," by Victor Wall. |
| Jan. | 6-8. | Course on Technical Information and Literature: College of Aeronautics, Cranfield. |
| Jan. | 7. | R.Ae.S.: Young People's Lecture, "Flying and the Human Machine," by Dr. G. Melvill Jones. |
| Jan. | 8. | Helicopter Association: "The Development and Flight Testing of Helicopters," by G. J. Sarsted and A. V. Coles. |
| Jan. | 9. | British Interplanetary Society: film show. |
| Jan. | 12. | Photogrammetric Society: "Small Scale Mapping," by Messrs. Wild Heerbrugg of Switzerland. |
| Jan. | 12. | R.Ae.S.: 94th Anniversary Lunch. |
| Jan. | 15. | R.Ae.S. (Agricultural Aviation Group): "Biological Factors in Agricultural Aviation," by C. V. Dadd. |
| Jan. | 15. | Institute of Navigation: "Heading Definition in Commercial Aircraft," by J. F. Green and A. P. Glenny. |
| Jan. | 16. | British Interplanetary Society: Schools Lecture, "The Scientific Exploration of Space," by Dr. N. H. Langton. |

# AIR COMMERCE

*Signed on December 4 in Bombay was the tripartite agreement uniting B.O.A.C., Qantas and Air-India in a commercial pool. Signing here are (l. to r.), Mr. Basil Smallpeice, managing director, B.O.A.C.; Mr. R. B. Patel, vice-chairman and general manager, Air-India; and Mr. C. O. Turner, chief executive and general manager, Qantas*

## WAKING HOURS ONLY

UNDER present arrangements, no jet aircraft are scheduled to land or take off at night at London Airport, and Mr. Duncan Sandys, Minister of Aviation, last week defined "at night" as between "about 11 p.m. and 7 a.m." He noted that permission had occasionally to be given for delayed jet aircraft to arrive or depart during these hours.

The Ministry has never made any specific order limiting jet movements to "waking hours only," but permission to operate at night has always had to be specially granted. When jet operations began, in October 1958, no jet movements were scheduled outside waking hours, and the Ministry's policy was put to its first test when, last April, Pan American advertised a daily 707 flight departing from London at 1.30 a.m. This service never in fact took place, presumably because the Ministry objected.

Sooner or later jet operators, including B.O.A.C. and B.E.A., must inevitably schedule jets at night. The real test will come next summer, when the Minister will have to choose between the rights of residents in the London Airport area to sleep, and the right of operators to schedule their jets round the clock.

Next summer at least 14* airline companies besides B.O.A.C. and B.E.A. will be operating jets in and out of London, and this airport, unlike New York, has no "overwater flight paths" for mandatory use at night. It is anybody's guess how the now hostile and highly organized London Airport residents will react to any lifting of the present "waking hours only" ban.

**Aeroflot (Tu-104), Aerolineas Argentinas (Comet 4), Air France (Caravelle), Alitalia (DC-8), B.E.A. (Comet 4B), B.O.A.C. (Comet 4, Boeing 707), E.A.A.C. (Comet 4), Finnair (Caravelle), Olympic (Comet 4B), Pan American (Boeing 707), Qantas (Boeing 707), S.A.S. (Caravelle), S.A.A. (Boeing 707), Swissair (Caravelle), T.C.A. (DC-8), T.W.A. (Boeing 707).*

## NO STATUS QUO

ALTHOUGH it is constitutionally possible for I.A.T.A. to attempt by a special fares and rates conference to close the open-rate situation before April 1, it seems unlikely that it will do so. The executive committee and General Meeting at Tokyo took the position that no conference should be called unless there was a strong desire for it on the part of I.A.T.A. members, but there seems no more evidence now that effective agreement is possible than there was at Tokyo. On the contrary, more than one airline is hoping to exploit the open rate situation.

I.A.T.A. point out that there is really no parallel between the present situation and that which existed in 1958 when the Cannes conference failed to reach complete agreement. In that case the conference recessed to continue the meeting at a later date; whilst the 1959 conferences adjourned *sine die* at Honolulu. It would therefore require either a two-thirds vote of the I.A.T.A. membership or a call by the director-general to bring them together for an entirely new session. In fact there will be a spring traffic conference but this will deal with non-policy matters and will not have fares and rates on its agenda.

The fact that I.A.T.A. failed to agree does not, of course, alter the fact that the fares charged by airlines must still be approved by all of the governments whose territories are concerned. As before, governments "still have the final word."

## REGAL—F.A.A.'s BLIND LANDING SYSTEM

RESEARCH by the U.S. Federal Aviation Agency into an all-weather landing system has been in progress for some while and an announcement that the system was to be called REGAL—range, elevation, guidance, approach, landing—was made earlier this year. More recently it has been described in broad detail by James T. Pyle, deputy administrator of the F.A.A., at the National Turbine Power Air Transportation meeting of the I.A.S. in San Francisco. REGAL is the work of the Agency's research and development bureau and in essence it is an airborne receiver which tells how far and how high the aircraft is from touchdown. The receiver takes and translates a narrow ground-based scanning beam (a refinement of the I.L.S. instrument landing system beam) and feeds it to a computer in the aircraft. The last-named is the second controlling element of the system; it analyses altitude and distance data from the airborne receiver and transforms it into autopilot commands or, in the absence of an autopilot, it provides a display for pilot control.

The first components of REGAL are to be delivered for ground testing of the guidance elements to the F.A.A. Research Center in Atlantic City in early January. Flight tests should begin in the middle of 1960 and if they are successful the F.A.A. will operate a complete engineering model soon afterwards. Mr. Pyle said also that the Agency were continuing to study U.S. Navy and Air Force and British developments in all-weather landing systems, and that the best elements of each would be examined before the ultimate U.S. civil system was drafted.

It is not at present expected that REGAL will be ready for operation until 1965, but in the meantime existing I.L.S. and radar facilities are being refined and strengthened. Mr. Pyle described all-weather landing capability as the F.A.A.'s "number one research project" which is being approached "from every direction." We hope to publish a detailed description of REGAL in an early issue.

## MODIFYING AER LINGUS FRIENDSHIPS

AER LINGUS Friendships are being returned to Fokker at Schipol for modification as they reach Check 4. These modifications include anti-corrosion treatment and re-skinning of the undersurface of the centre-section. During fatigue testing of one of the pre-production aircraft by Fokker, a small skin crack appeared on the underside of the mainplane and it was decided to fit a thicker gauge centre-section skin to the undersurface (see T.A.A. and the Friendship: An Instructive Pre-Delivery Episode, *Flight*, April 3, 1959). Since the batch of aircraft for Aer Lingus was already in an advanced state of construction at this time, it was decided to carry out retrospective modification of the first five aircraft (constructor's numbers: 10105, 10106, 10107, 10109, 10110) before they reached 5,000 hours of airframe life. The remaining two aircraft for Aer Lingus and those ordered by Trans-Australia Airlines were delivered with the modification incorporated. Fairchild F.27 aircraft are not so modified and, it appears, the Netherlands Department of Civil Aviation do not consider that the modification is necessary at this stage in the career of the aeroplane.

## A.L.P.A. ARE ANGRY

A WORDY paper battle is being waged between the U.S. Airline Pilots Association and the U.S. Federal Aviation Agency. Two matters are of concern to the pilots: the F.A.A.'s order (which is to come into effect on March 15, 1960) that all airline pilots should retire on reaching the age of 60, and the Agency's new qualification standards for co-pilots. The pilots' contention is that these two matters are inter-related, not only because both bear upon matters of air safety, but also because of their effect upon the Association's concept of "a fail-safe crew."

A.L.P.A. has never been known to pull its verbal punches, and some hard words are being said about the F.A.A. by the Association's president, Clarence N. Sayen. He has described the retirement of pilots at 60 "as a whimsical and capricious action for which no evidence of need has been established, a serious abridgement of legal property rights of private citizens and a rule adopted as a result of improper procedures." He said also that the rule would deprive "competent, healthy, experienced pilots over the age of 60 of as much as $28,000 per year, on an arbitrary judgment that makes no distinction between competence and incompetence or state of health but assumes that health and proficiency immediately fails to meet standards at some age picked out of a hat." Referring to the F.A.A.'s "Czarist" powers, he said: "There is not a single pilot, irrespective of age, including those over 60 . . . whose physical fitness and flight proficiency has not been certified by the F.A.A., and will not again be certified by the F.A.A. within the next six months and every succeeding six months. . . . If safety were involved the A.L.P.A. would

## AIR COMMERCE . . .

be one of the first to support [the regulations], but safety is not involved. It is strictly an industrial relations problem."

To support their case A.L.P.A. have collected together statements from medical and industrial authorities on pilot age and capability, and statistics about in-flight incapacity. The latter, it is claimed, are unrelated to age or to overall health, and are not of the type predictable by the medical profession but generally due to such everyday things as stomach ache or food poisoning. Of the possibilities of deaths due to cardiac causes among airline pilots, Mr. Sayen suggested that in 1962 only one death from this cause could be expected from pilots of 60 or over, but that five would be expected in the 45-49 age group. In any case, there was very little probability that any of these would take place in the cockpit—no U.S. pilot of over 55 has ever died in flight.

A better approach to the cockpit safety problem, in A.L.P.A.'s view, is for the co-pilot to be trained to take over if the pilot is disabled and to have a third crew member qualified to relieve the co-pilot. On this premise, A.L.P.A. are attacking the F.A.A. rules for co-pilot training and proficiency checks, about which "they are greatly disappointed by enactment of such weak regulations." In detail their criticisms of the F.A.A. rules are that (1) Co-pilots do not need to have a type rating on the aircraft in which they are flying. (2) Proficiency checks are required at yearly instead of six-monthly intervals. (3) Initial qualifications are low. (4) Although the F.A.A. require training programmes to be approved, they do not specify what these programmes should be, and (5) The airlines have more than a year in which to comply with the new rulings. This could lead to a situation, said A.L.P.A.'s president, where an airline could hire a pilot with 200 hours' club time, a commercial licence and instrument rating, give him some undefined training, check him out on one type of airplane, assign him to fly in a completely different type and then not check his proficiency for a year. "The combination of F.A.A.'s action on co-pilot qualification and compulsory retirement indicates that they have missed the air safety point involved."

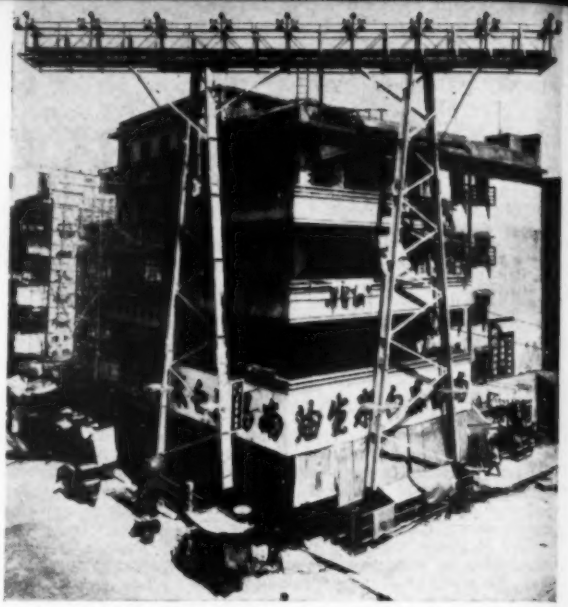
The F.A.A. for their part are equally adamant that their action is the right one, and they are equally prepared to support their case with statistics. They say that there is an increasing possibility of heart attacks and strokes after the age of 40; that 2.4 per cent of the pilots over the age of 55 can be expected to suffer thus each year and that pilots of 55 or over require twice as long to qualify on the Boeing 707 as those of under 40—in spite of their greater experience. The figures they quote are: under 40, 16 hours and 55-59, 25 hours, although some require as many as 40 hours.

There is no fixed retirement age for British Corporation pilots, nor a maximum age at which pilots will be accepted for jet training but a pension scheme yet to be approved by the Minister of Aviation provides for retirement of pilots now under 45 at 55 and over 45 at 60.

## HOLD THAT LOUNGE

NEW information on the operation of mobile lounges at Dulles International Airport has recently been given by the F.A.A. (A description and illustrations appeared in *Flight*, December 4, pages 680 and 681.) The entire terminal area and buildings at Dulles are being designed around the use of mobile lounges and the maximum distance that airline passengers will have to walk will be less than 300ft. Lounges will be driven to each gate position as they are needed, and parked so that entrance to them is made direct from the terminal building. They will be used as a waiting room where tickets are collected and for marshalling passengers for a specific flight. Just before the flight time they will be driven the 4,000ft or so from the terminal building to the distant parking area and passengers will then walk straight into the aircraft; at no time will any traveller be exposed to the weather or to jet blast.

Thirty gate positions are to be constructed at Dulles and by 1975 the requirement will probably be for 60; the F.A.A. expect that with mobile lounges they will save about 30 per cent on the cost of fixed-installation fingers. The lounges are to be paid for by fees levied on user-airlines; about 20 are to be constructed subsequent to the prototype vehicle.



*No ancient lights: G.E.C.'s solution to the problem of erecting No. 3 crossbar lights on the approach to the new runway at Kai Tak, Hong Kong. The task of putting high- and low-intensity approach lights, with lead-out lights on the reverse side, across difficult terrain constituted one of the largest airfield-lighting jobs ever attempted*

*In the news on these pages for the third successive week is the Handley Page Dart Herald. On December 4 it was flown from Radlett by King Hussein of Jordan, seen here in the right-hand seat. He was accompanied by W/C. Dalgleish, o/c Royal Jordanian Air Force, and Mr. J. Allam, H.P. deputy chief test pilot*

## I.C.A.O.'s POSTHUMOUS AWARD

EVERY two years, a gold medal known as the Dr. Edward Warner Award, commemorating the man who was president of the I.C.A.O. Council from 1945 to 1957, is to be awarded by the I.C.A.O. Council for "outstanding contributions to the development of international civil aviation."

The first such award was made this month and is being bestowed poshumously on Dr. Albert Plesman, the founder and long-time president of K.L.M. who died at The Hague on December 31, 1953. The citation reads as follows:—

"Dr. Plesman's initiative and foresight as a pioneer, coupled with his great creative and organizing ability, resulted in the formation of an international airline at a time when there were few indeed who had faith in such an undertaking. They were instrumental as well in establishing the International Air Traffic Association, the fore-runner of the present I.A.T.A., an institution in which Dr. Plesman played a leading rôle. Above all, he helped to shape the future, inspiring others by his example to act upon the belief, now inscribed on his memorial in The Hague that 'The Air Ocean United All Peoples.'"

A reference to the founding of K.L.M. appears in the article "First of the Many" on the opposite page.

## WORLD'S LARGEST COMPUTER SYSTEM

WHAT is described by International Business Machines as the largest data-processing system in the world has been developed to provide centralized electronic reservations for American Airlines. Two transistorized computers set up in the airlines' New York headquarters will deal with reservations queries by over 1,100 booking offices throughout the United States. The machines will also automatically send teletype messages to other airlines asking for space on their flights, quoting fares, supplying information about the day's flights and notifying agents when special action is required.

Operation of the equipment is described by I.B.M. as follows: When a customer asks for a reservation the sales agent will select a card listing all the information about the route and insert it into an "air information device," at the same time pressing a button to indicate the date of the trip and the number of seats requested. By pushing an "availability" button all the information is transmitted over telephone lines to the computing machine in New York, where the computer scans its magnetic-disc memory files to see what flights have space available. Lights in the agents' office indicate that an answer has been received and when the passenger has made his decision the agent presses another button marked "sell" which instructs the computer to make a reservation

and adjust its inventory. A machine in the agents' office automatically prints the details of the flights and these are handed to the passenger. Even such special requests as a car to meet the passenger at his destination airport can be arranged by means of the electronic reservations system, which will store such information on its memory drums in the central computer in New York. The amount of work that the computers can handle is considerable. In the first stages of operation they are expected to cope daily with 85,000 telephone calls, 40,000 reservations and 30,000 exchange messages with other airlines, as well as 30,000 fare quotations and the sale of 20,000 tickets. At peak periods reservations may have to be handled at a rate of 7,500 every hour.

# FIRST OF THE MANY

IN compiling his recent table of significant dates during air transport's formative years Mr. Peter Brooks did much to rationalize knowledge on the subject.

His list was substantially correct in the description of the individual events. Items which call for comment are limited mainly to observing that the first French domestic air service was by the Lignes Aeriennes Farman (later S.G.T.A.), not C.M.A.; to note that the Philadelphia Rapid Transit Service was not the first U.S. passenger service; and perhaps to remark that the U.S. Aerial Mail Service was operated by, not for, the U.S. Post Office. However, these minor comments are less important than a general observation that the list was a little misleading in that the services, whether sustained or short-lived, included some comparatively insignificant flights whose claim to the description "scheduled" was doubtful, whilst, on the other hand, one or two important services were not mentioned.

The starting point for compiling a list of significant flights—an occupational disease of many concerned with air transport history—must, of course, be the inaugural service on August 25, 1919, by Air Transport & Travel (a direct antecedent of B.O.A.C. and B.E.A.). The important point to remember, is that this service can make its claim to "firstliness" only if it is qualified by six adjectives. These are (a) regular, (b) international, (c) daily, (d) passenger, (e) civil and (f) sustained. Only if all six of these reservations are made can A.T. & T. be granted pride of place—though few would deny that Holt Thomas's service was the most important and far-reaching of all. There is no need to explain the first five qualifications listed above. As to the sixth, a complete year's operations (thus eliminating seasonal routes) or the intention to sustain the service, are essential factors for eligibility.

The first *regular civil daily passenger* service was the Benoist Air Line, at Tampa, Florida, on January 1, 1914. This carried passengers across the bay to St. Petersburg; was scheduled to make two trips a day; and it ran for two to three months.

If the Benoist service is dismissed as being in the nature of a series of novelty trips, then the credit for the first *daily, civil, regular, sustained passenger* service must go to Deutsche Luft Reederei (an antecedent of Lufthansa), which opened the Berlin - Leipzig - Weimar route with a 5-seater A.E.G. biplane on February 22, 1919. Regular flights were suspended on August 1, 1919, only because of acute petrol shortage in Germany.

There had been examples of experimental air mail services in several countries prior to 1918 but the first official *sustained international air mail* service available for civil use was opened by the Austro-Hungarian military forces on a route from Vienna to Kiev, via Krakow and Lemberg, on March 20, 1918. Frequency was two to three times a week, increasing to a daily service. A branch line was opened to Odessa and a second route Vienna - Budapest was opened in July 1918, but the service was discontinued in November 1918, on the disruption of Austro-Hungary.

The first *sustained regular international civil* service was inaugurated by Lignes Aeriennes Farman (an antecedent of Air France) with a Goliath, piloted by Lucien Bossoutrot, from Paris to Brussels on March 22, 1919. This was the beginning of a weekly service; and, a fortnight later, Customs officials were on duty at Brussels for the first time.

Events moved so quickly in Europe that by the time Lt. Lawford made his historic journey from London to Paris six companies from six different countries were already able to express their community of interest by forming I.A.T.A., on August 28, 1919. One of these, Det Danske Luftfartselskab (a forerunner of D.D.L.), was able to claim the honour of being the first commercial company to be organized as an airline—on October 28, 1918—though operations did not begin until two years later.

Another European airline, the Dutch Konimklijke Luchtvaart Maatschappij (K.L.M.), made its first flight a few weeks later, on October 7, 1919, and except for a five-month period during the winter of 1920-21, has remained in continuous service ever since, a remarkable and unique record.

Meanwhile, in the U.S.A., with the carriage of mail regarded as the most important goal of air transport, a Post Office mail service was begun on May 15, 1918, between New York and Washington via Philadelphia, and the establishment of the transcontinental mail service was put under way on May 15, 1919, the first coast-to-coast flight being opened on September 8, 1920. Continuous service was provided by the U.S. Post Office until September 1, 1927, when the right to carry mail was turned over to private operators.

The first *regular civil daily passenger* air service in the United States was opened on November 1, 1920, by Aeromarine Airways, Inc., from Key West to Havana. Aeromarine seaplanes carried passengers, mail and freight (mainly excess baggage) once daily each way. The service on this route ended on May 1, 1921, when the aircraft were transferred to Lake Erie, where they operated between Detroit and Cleveland from June 1 until October 1. Aeromarine operated its last service between Miami and Nassau on May 1, 1924, but during its short life had provided a neat example of maintaining high utilization by a study of the peak problem.

The difficulty, of course, is just where to draw the line, but by ruthlessly omitting those services which cannot claim more than three of the qualifications listed, the table below results. This contains only seven entries which are, it is submitted, an irreducible minimum if the picture is to be presented fairly in perspective.

One more qualification should, perhaps, have been made to the six. The term "heavier-than-air" is one seldom seen today but in the early days of air transport the fixed-wing aeroplane was not accepted as the only solution to carrying a paying load. Indeed, an air transport historian of 1920 would probably have started his list with an account of the activities of Der Deutsche Luftfahrt Actien Geselschaft (DELAG), whose fleet of airships carried some 17,000 passengers in Germany between 1910 and 1912. Most of these undoubtedly were excursion trips but many intercity journeys were also made.

An analysis of historic "firsts" does little more than place on record some comparatively minor incidents. Taken together, however, the picture is clear; the world as a whole was experimenting in putting the aeroplane to peaceful work—and it is appropriate that the direct descendants of the pioneer airlines are among the leaders in air transport today.

R. E. G. DAVIES

**Footnote:** Following publication of his table (which appeared in *Flight* for August 21 last), Mr. Peter Brooks explained for the benefit of a correspondent that in effect it dealt with 25 pioneer services inaugurated at various dates up to September 24, 1919, which just excluded the well-remembered Instone service as well as a number of others. The remaining three items in his table, relating to services started in 1921, 1922 and 1926, were added by reason of having special claims (first Australian service, first sustained U.K. internal service and first U.S. passenger service).—Ed.

**SEVEN IMPORTANT "FIRSTS" IN AIR TRANSPORT**

| Date | | Company | Route | Aircraft | Qualifications | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Begun | Ended | | | | Regular | Civil | Daily | Passengers | International | Sustained |
| Jan. 1, 1914 | March, 1914 | Benoist | Tampa-St Petersburg | Benoist | ☆ | ☆ | ☆ | ☆ | | |
| Mar. 20, 1918 | Nov., 1918 | Austro-Hungarian military line | Vienna-Kiev | Not known | ☆ | ☆ | † | | ☆ | ☆ |
| May 15, 1918 | May 15, 1919 | U.S. Post Office | Washington-New York | Curtiss Jenny | ☆ | ☆ | ☆ | | | ☆ |
| Feb. 22, 1919 | Aug. 1, 1919 | Deutsche Luft Reederei | Berlin-Weimar | A.E.G. | ☆ | ☆ | ☆ | ☆ | | ☆ |
| Mar. 22, 1919 | Sustained | Lignes Aeriennes Farman | Paris-Brussels | Farman Goliath | ☆ | ☆ | | ☆ | ☆ | ☆ |
| Aug. 25, 1919 | Dec. 17, 1920 | Air Transport and Travel | London-Paris | Airco D.H.4A | ☆ | ☆ | ☆ | ☆ | ☆ | ☆ |
| Nov. 1, 1920 | May 1, 1924 | Aeromarine Airways Inc. | Key West-Havana/ Detroit-Cleveland | Aeromarine Seaplanes | ☆ | ☆ | ☆ | ☆ | ☆ | ☆ |

† Began at 2-3 times weekly frequency; increased to daily.

## AIR COMMERCE . . .

### SUPERSONICS: THE DOUGLAS VIEW

TECHNICALLY, it will be possible to build a supersonic jet transport in the U.S. in the 1963-65 period, though for reasons of safety and economy 1968 to 1970 is more likely, and because of financial considerations it is not likely that the airlines will order such a transport until 1970-75. Those are the considered opinions of Dr. V. V. Holmes, project engineer in the advanced design section for transport aircraft of the Douglas Aircraft Company. Dr. Holmes' remarks were made at a meeting of the Dayton-Cincinnati section of the Institute of Aeronautical Sciences held in Cincinnati on November 17.

Dr. Holmes foresaw four basic requirements for supersonic transports of the future. They must be able to carry a capacity load a non-stop distance of 3,500 nautical miles—enough to cross the North Atlantic. Future supersonic transports must be able to use the same airfields as today's jet transports "because we simply cannot expect local communities to continue building new airports for larger and larger aircraft." The supersonic jet transport of the future must have a per-seat-mile direct operating cost comparable to present subsonic jet transports "because the public will not pay a premium fare for a prima donna aircraft." Finally, Dr. Holmes said that the supersonic transports of the future "must match or exceed" the safety, reliability and comfort of the jets of today.

For a variety of reasons, many of them inter-related, Dr. Holmes believed the supersonic jet transport of the future would have a cruising speed in the neighbourhood of Mach 3. One reason is that the speed of supersonic bombers now under development in the U.S., and the technology learned through their development, would in large measure dictate the performance of future supersonic transports that would be an outgrowth of these developments. Military assistance or some other form of governmental subsidy was required for any supersonic jet transport development, in the opinion of Dr. Holmes, and much more was required for speeds well in excess of Mach 3.

"Afterburning, while perhaps necessary for take-off, will be pretty much out of the picture as far as cruising is concerned," Dr. Holmes said. Fuel consumption with afterburning was simply too expensive, and for reason of cost, high energy or special fuels were ruled out of the picture. Non-afterburning engines—perhaps six of them per aircraft—would be used. They should have a fuel consumption that does not exceed an s.f.c. of 1.57 and turbine inlet temperatures of 2,000 to 2,200 deg F, about 400 deg F above present-day production engines.

Because of the high cruising altitude—nearly 70,000ft—passenger and crew compartments would be pressure vessels, without windows, and with structural strengths more or less equivalent to the load-carrying capabilities of an aircraft wing. These were other general characteristics he presented for a supersonic jet transport:—

Range, 3,500 n.m.; cruising speed, 1,725 kt; block speed, 1,460 kt; direct operating cost, $4,000/hr, $2.60/n.m., 1.3c/200 lb-n.m.; passenger capacity, 160; number of engines, 6; gross take-off weight, 500,000 to 600,000 lb (about half of which would be fuel); and the manufacturer's empty weight, 200,000 to 250,000 lb.

Despite the contribution of the armed services, the supersonic transport of the future would be very costly to develop. The DC-6 took 700,000 engineering man-hours for its development, and the DC-8 jet transport required ten times that number—seven million. According to Dr. Holmes, a supersonic jet transport could not be developed for less than 14 million engineering man-hours.

As far as costs were concerned, the DC-8, which flew at about twice the speed of the DC-4, nonetheless cost 20 times as much to develop. The development cost for the DC-8 was about $300m, and the cost for a supersonic jet transport conceivably could not be less than twice that amount, or $600m (£214m), and could be as high as $2,000m (£715m).

Dr. Holmes presented the following table to compare fuel, airframe and engine costs as a part of the total direct operating costs for today's subsonic jet transports and tomorrow's Mach 3 transports:—

**Percentage of Total D.O.C. (cents per 200 lb n.m.)**

| Item | Subsonic Jet | Mach 3 |
|---|---|---|
| Fuel ... ... ... | 37 per cent | 60-70 per cent |
| Airframe ... ... | 34 per cent | 15-20 per cent |
| Engine ... ... | 29 per cent | 10-15 per cent |

Note: Mach 3 fuel cost and airframe cost ($/lb.) assumed to be the same for subsonic and supersonic aircraft.

Among the problems connected with supersonic transports, Dr. Holmes called attention to the growing air traffic problem, and pointed out that extra fuel reserves, such as are carried by today's jet and piston aircraft, simply are too expensive to uplift in a supersonic jet. For this reason, and because of the fact that a U.S. transcontinental flight might take only 1 hr 45 min, it would not be feasible to hold over an airport for an hour waiting for clearance to land.

But financing loomed largest in his mind as the single item that would delay the age of supersonic air travel. Today U.S. airlines had over $2,000m tied up in new equipment, and some of this indebtedness was long term. This would keep the airlines from taking on new indebtedness for several years, probably not until 1970 or after. Also, the airlines today were turning more of their attention to short-haul jet traffic rather than toward speeding long-haul traffic such as would be interested in a supersonic jet transport. It would be a few years—well into the 1960s—before the airlines had equipped themselves with jets for short-haul traffic and before they could turn their attention to giving long-haul passengers some extra speed.

### . . . AND A SUPERSONIC SYNDICATE

BEING explored by manufacturers on the U.S. West Coast is the idea of an airlines' and manufacturers' consortium to finance a supersonic transport. Douglas, Lockheed, Convair and North American all now seem fairly certain that it is technically feasible for a supersonic transport to be flying in 1963 or 1964. Discussions are centred around the suggestion that the heavy costs of development are better shared than borne alone, and that airline

*Last week Mr. Duncan Sandys, Minister of Aviation, announced that London Airport's 9,576ft runway 28L is to be extended to 11,000ft by 1961. The extension is shown dotted on the right of this recent photograph*

*Presenting the warrant of constitution to Mr. T. R. Thomson, Master of the G.A.T.C.O. East Africa Lodge is (left) Mr. J. A. R. King. In the centre is the High Commission Administrator, Mr. E. B. David*

ideas on supersonic equipment should be reconciled at an early stage with a view to the joint construction of a single project. Although the cost of development remains an unknown quantity, current thoughts suggest that even with U.S. supersonic experience at least £100m will be required; but, as Douglas suggest, it may be many times more.

Talks on joint manufacture have been held between North American and Boeing, who have frequently been suggested as likely members of a U.S. supersonic consortium, while Douglas, who have dipped heavily into the red with the DC-8 programme, might also react favourably to suggestions for partnership. On the airlines' behalf, Continental are said to be taking an active interest in supersonic airliner projects. Mr. Peter Masefield, managing director of Bristol Aircraft, has frequently advocated an Anglo-American approach to supersonic airliner construction and exploratory talks have been held between Bristol and Lockheed; but prospects here do not seem to be particularly bright.

## FIDO FOR LONDON'S FOGS?

ALTHOUGH a decision on the commercial feasibility of installing the Fido fog dispersal system at London Airport should soon be made, arguments about the system in the House of Commons last week followed much the same pattern as always before. Mr. Sandys, Minister of Aviation, said that considerable technical difficulties had arisen and that it would be for the airlines concerned to see whether the cost would be worthwhile. The best estimate he had been given was that it would cost something between £500,000 and £1,000,000 to install Fido on one runway and that the cost of fuel consumed would be about £250 for each landing.

Asked how the alternative system of blind landing was progressing, Mr. Sandys said, "You have struck the point. In considering whether this is commercially feasible we have to take into account how many years it would be—and it would not be many—before airliners were fitted with blind landing systems which would make any fog disposal system unnecessary."

## VIEWPOINTS ON SAFETY

LAST Friday, December 11, an all-day symposium on flight safety was held at the Institution of Mechanical Engineers in London. The meeting was chaired by Mr. Walter Tye of the Air Registration Board. Four papers were presented, two by airline pilots, one by a constructor and one by an accident investigator. The respective speakers were Capt. J. W. G. James, director of flight operations, B.E.A., who gave the paper *The Operator's View*; Capt. E. C. Miles of B.O.A.C., deputy president, I.F.A.L.P.A., and a council-member of the Air Registration Board, whose paper was *The Airline Pilot's View*; Mr. P. G. Tweedie, chief investigator, accident investigation branch, M.o.A., who gave *The Accident Investigator's View*; and the final paper was *The Aircraft Constructor's Problems*, given by Mr. R. H. Warde of Bristol Aircraft. We hope to review the day's papers and discussions in a forthcoming issue.

# BREVITIES

It is reported that the DC-9 is now being projected with four engines mounted on the after fuselage instead of in under-wing pods.

A duty-free liquor counter for long-distance passengers has been opened at London Airport.

A meeting was recently held in Panama City between the managements of airlines in Columbia, Peru, Chile, Venezuela, Panama and Ecuador to discuss a possible merger.

A preliminary report by the Italian Department of Defence attributes the accident to the T.W.A. Constellation near Milan on June 26 to an explosion in the fuel tanks.

B.O.A.C.'s application to operate a Polar route service between London and Los Angeles has been endorsed by the C.A.B. The Board has yet to pass its decision to President Eisenhower for final approval.

Chile and Switzerland are reported to be near to signing an agreement which would allow Swissair to extend their services from Buenos Aires to Santiago, although the airline would not be allowed to fly north from Santiago along the Pacific coast.

The F.A.A. has proposed the adoption of special air traffic rules to reduce noise at Los Angeles airport. An area of airspace up to 2,000ft high and with a radius of five miles from the geographical centre of the airport would be designated, in which special rules would apply. One of these would be a minimum jet descent angle of three degrees.

A Ministry of Aviation information circular requires that all U.K.-registered aircraft flying to and from Berlin shall be equipped as a minimum with A.D.F. and either Decca, I.L.S. (capable of receiving the aural legs of V.A.R.), or V.O.R. The Minister's approval is also required of written instructions to flight crews on the navigational drills and procedures to be followed.

At an inquiry into applications from local authorities to build on 73 acres on the fringe of Horley, it was said that this land lay in the direct path of Gatwick's proposed third runway. An official of the Ministry of Transport's planning department said that it was unlikely that a third runway for Gatwick would ever be built; but if it was it would only be a grass runway for very light aircraft.

The 25th anniversary of the Kangaroo Route between London and Sydney through the Middle East was celebrated by Qantas and B.O.A.C. on December 10. Over half a million hours have been flown on the route and 617,752 passengers have been carried. December 10 marked the 40th anniversary of the day that Ross and Keith Smith made the first aerial crossing of the Timor Sea, completing the first flight from England to Australia.

A flight was being made in New Zealand on December 16 to commemorate the 40th anniversary of the first Royal Air Mail in that country, carried between Auckland and Dargaville on December 16, 1919. The pilot on that occasion, Mr. G. B. Bolt, is now chief engineer of T.E.A.L.: he was to fly in last Wednesday's re-enactment with Capt. F. Ladd, of N.Z. Tourist Air Travel, who was piloting a Grumman Widgeon. (The original air-mail flight was made in a Boeing and Westervelt twin float seaplane, powered by a 125 h.p. Hall Scott engine, and Mr. Bolt was accompanied by Mr. Leo Walsh, who was then a director of the New Zealand School of Flying.)

President Eisenhower has approved the award to B.W.I.A. of routes between Barbados and New York and between Jamaica and New York.

Portsmouth City Council have decided not to allow part of Southsea Common to be used as a helicopter station.

Air France are to use Sabena-manufactured first-class seats in their Boeing 707s. The seat was designed by M. François Braun, a Sabena engineer.

A facilitation meeting of I.C.A.O. was started in Montreal on December 1. It was the fifth session of I.C.A.O.'s Facilitation Division and it was attended by representatives of more than 30 nations and international organizations.

Lockheed Aircraft Services are to convert two of Air-India's Super Constellations from passenger to all-cargo configuration. The aircraft will probably be used on freight services between the United Kingdom and India.

A B.O.A.C. Comet 4 on a proving flight to Santiago was refused permission to land at Buenos Aires airport on December 9. The message was passed when the aircraft was on its final approach, apparently as the result of a misunderstanding about the Comet's time of arrival.

A Curtiss Commando of Sociedad Aeronautica Medellin, S.A., carrying 43 passengers and acrew of three on a flight between San Mares Island and Cartagena, was reported missing over the Atlantic on December 9.

South African Airways have introduced a daily non-stop Viscount service between the Cape and Johannesburg to connect with B.O.A.C. Comet services. This month a weekly economy class service between Johannesburg and Durban is to be introduced for non-Europeans.

Mr. J. E. D. Williams, B.Sc., F.I.N., A.F.R.Ae.S., who has been a consultant for 21 months, has now formed a company, J. E. D. Williams and Co. (Aviation Consultants) Ltd., 33 Thurloe Square, London, S.W.7. "Jed" Williams was formerly technical adviser to the managing director of El Al.

The West German Air Transport Office is still considering whether it should re-open an inquiry into the B.E.A. Elizabethan accident at Munich last year. Dr. Walter Stimpel, head of the inquiry commission, said on December 5 that he hoped the commission would be able to discuss before Christmas the most recent letter from Capt. James Thain, the pilot of the Elizabethan.

T.E.A.L. have bought a 50 per cent share in Fiji Airways at an estimated cost of £88,000. Major policy decisions concerning Fiji Airways now require the agreement of the Australian and New Zealand Governments who have agreed to participate equally in the ownership of Fiji. Shares will be held by Qantas and T.E.A.L. but an intergovernmental arrangement provides for participation in the ownership of Fiji Airways by other British interests.

# AVIAN GYROPLANE PROGRESS

## VTOL AND 150 m.p.h. FOR PRIVATE PILOTS

IN an effort to produce a simple, cheap and effective means of air transport, a group of former Avro Aircraft engineers has designed and built an autogyro with vertical take-off and landing capability. The engineers formed a company called Avian Industries Ltd., at Georgetown, Ontario, and have designed and built a prototype of the 2/180 Gyroplane in seven months. It is a tandem two-seater based on a steel keel and rotor pylon forming the entire primary structure and supporting seats, controls, undercarriage and a rear-mounted Lycoming 180 h.p. flat-four engine. The three spring-steel undercarriage legs are each held to the keel by a single bolt. Propulsion in autorotative flight at cruising speeds of 150 m.p.h. is by a ducted fan propeller at the tail with a small aerodynamic rudder mounted in the ring. Additional kinetic energy required for vertical take-off and landing to and from 200ft is provided by cold tip-jets supplied from a compressed-air container continuously charged by an engine-driven pump. The three-bladed rotor is controlled by aerodynamic tabs at the trailing-edge near the tip, although it is not made clear whether cyclic- and collective-pitch changes are made in conventional helicopter fashion or not. Power-off approaches without tip thrust can be made at 20-25 m.p.h. with touch-down at 15 m.p.h. Very little has yet been said about the actual method of control, particularly during landing and take-off.

It is claimed that the Gyroplane can be flown by relatively inexperienced fixed-wing pilots and that the machine should cost less to operate than a car. Target price of production versions is $10,000 and Gyroplanes should be available next April. The company sees a sales potential of 5,000 aircraft per year and the planned initial production of 20 per month is thought to be capable of satisfying only the local demand in Ontario.

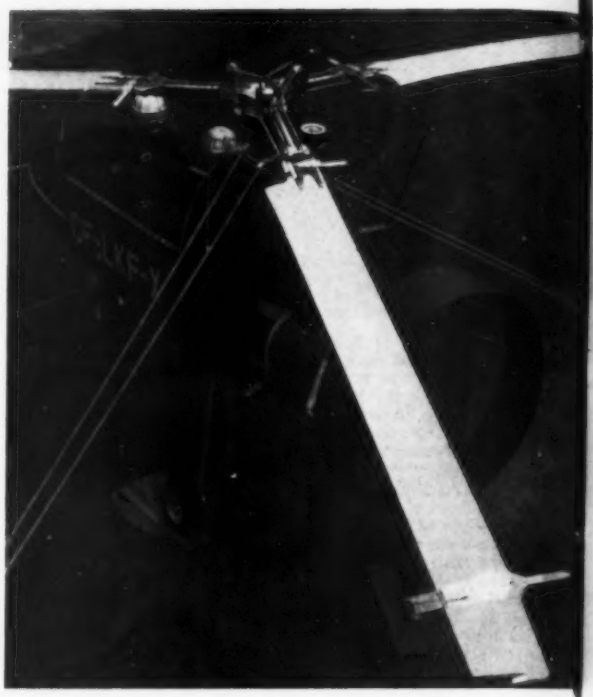
The first prototype, designated 2/180B, was to have flown on September 30, but a change of premises, a decision to dispense with subcontracting and negotiations with the Government have caused some delay. Moreover, the first prototype, which has now completed taxying tests and some tethered running, has a belt-drive from the rear of the engine to the rotor for early trial work.

According to Avian, the autogyro concept represents a major step in the direction of low cost and improved performance in itself, but the use of kinetic energy by over-speeding the rotor on the ground was too unsafe for jump take-off and landing in an aircraft for relatively inexperienced pilots. Particularly in the landing case, the kinetic energy in a practical rotor is barely sufficient for a perfect landing. To obtain sufficient stored energy for simple landings and overshoots, the compressed-air system was developed, so that the pilot not only has rotor kinetic energy for landing but a compressed air reservoir containing an additional five times this energy. This also allows a jump take-off to a height of about 200ft.

A helicopter with a conventional rotor system is dynamically unstable at low forward speeds, and relatively difficult to control, but Avian have developed a servo tab-controlled rotor offering inherent true dynamic stability even in the hover. With high off-set flapping hinges, the servo tab-control gives very high initial angular acceleration, and ample damping in pitch and roll so that, although the initial acceleration exceeds the minimum Mil. Spec. requirements the maximum rate of pitch and roll is very low, being less than 10 deg/sec at low speeds. This means that the pilot's stick is a rate control device, rather than an acceleration control, an improvement which has long been sought by human engineers. In yaw control characteristics the Avian 2/180 conforms to the Mil. Spec. helicopter requirements in hovering, and to conventional fixed-wing practice in forward flight.

The blades have no drag hinges but are relatively heavy and have exceptionally high in-plane stiffness. Their structure is steel, with glass plastics skins stabilized by hardwood forward of the main spar, and by balsa in the trailing-edge section. Use of steel and the fact that the blade angle of attack is determined almost entirely by the tab angle leads Avian to believe blade tracking will not be necessary in service unless for some reason a tab control circuit is changed. The tabs give very light stick forces. Aluminium alloys have been avoided where fluctuating stresses are more than 1,000 lb/sq in so that the rotor system and the main fuselage structure are of steel. With a design fatigue reserve factor of three infinite fatigue life should be obtained for all components. The blade retention straps have a reserve factor of six because they are designed on a stiffness requirement, and each strap is composed of 25 individual laminations. Extensive damage to the floor structure or the exterior skin has no effect upon the safety of the aircraft, which can in fact be operated without any of these items attached. A crash landing will often result in no more than bent undercarriage legs which can be replaced by the removal of three bolts.

The 150 m.p.h. cruising speed of the Avian at 75 per cent power is due primarily to its small size and clean aerodynamic form and also to the use of a ducted fan. Moreover, the fan duct replaces fin and tailplane and enables the rudder or yaw vane to be mounted immediately behind the propeller where it is most effective. A fixed-pitch propeller can be used without performance sacrifice, propeller noise is reduced and the duct constitutes a valuable safety feature. Because an autogyro rotor is always in rotation, the familiar "dead man's curve" of a helicopter is absent. The most dangerous flight condition would occur if the engine failed in the first second after take-off, but with the air bottle system a normal landing could be made from any height below 100ft. Thus the Avian 2/180, although a single-engined aircraft, has a very high degree of safety with respect to engine failure even in the event of a failure in normal flight before the air bottle had been recharged by the engine-driven compressor.

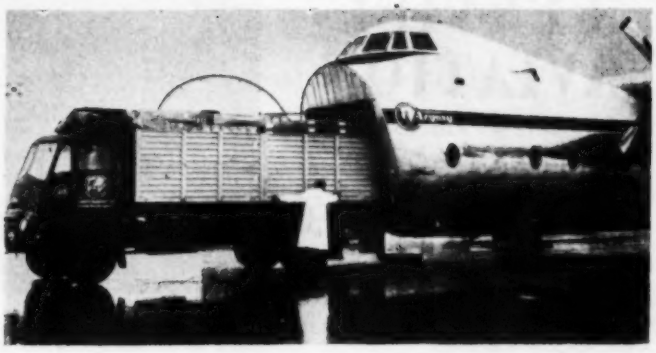


*Tethered trials with the engine-driven rotor. Note the air nozzles and tabs at the tips and the tab-control cables and push-rods at the roots. Control rods pass vertically down the pylon*

**Avian 2/180 Gyroplane (Lycoming O-360): Rotor diameter, 26ft; overall length, 14ft 7in; height, 7ft 11in; cockpit width, 35in; empty weight, 1,000lb; gross weight, 1,600lb; internal fuel, 26 Imp gal; maximum cruising speed, 150 m.p.h.; minimum speed, 0 m.p.h.; maximum rate of climb, 1,500ft/min; normal still-air range, 450 miles.**

*Taxying trials with Ron Peterson piloting and Avian president Peter Payne as observer. It is not stated whether the 2/180B can be flown solo*

*Cargon containers being loaded into an A.W.A. Argosy*



# PLATFORMS AND PALLETS

ALTHOUGH the carriage of freight by aircraft has been increasing fairly steadily over the last few years, it still amounts to only a tiny proportion of the total world freight traffic, and is mainly restricted to goods of high intrinsic value or perishables. The reason is, primarily, that air freight charges are very high—although there are offsetting advantages in the lower insurance, packaging and handling rates as well as in speed. And charges are high for the simple reason that with the vast majority of existing aircraft used for transporting freight it is impossible to achieve high utilization, simply because they were not designed in the first place for freighting purposes and cannot readily make use of modern handling aids. Because the demand for aerial freight transport has remained small, operators have hesitated to call for specialized freighter aircraft capable of more efficient operation; in fact, the air freighting situation has become something of a vicious circle. It has remained for a British aircraft constructor, Sir W. G. Armstrong Whitworth Aircraft Ltd., to attempt to break the circle by placing on the market an aircraft that has been conceived as the main element of a commercial cargo transport system for intensive operation at low costs.

The Argosy is not, of course, the first aircraft to be designed with a level freight floor at a height of 4ft above the ground suitable for direct loading from a flat-bed truck; the Lockheed C-130 and Douglas C-133 multi-purpose military transports both embody this concept. But the Argosy goes one better in that full-width full-height hydraulically operated one-piece doors are provided at each end of the hold, thus doubling the rate at which cargo can be on- or off-loaded. Although conventional lashing points are built into the aircraft, its full potentialities are most likely to be realized by handling the loads on pallets and making use of simple roller or wheeled conveyor systems. On scheduled cargo operations aiming at high utilization the saving in turn-round time made possible by the use of pre-loaded pallets will far outweigh the weight penalty of the pallets and roller system.

Again, the concept of "palletizing" aircraft cargo for achieving ease of handling—by minimizing the number of units to be loaded—is not new; but on converted passenger aircraft with side-loading doors its possibilities for speeding-up loading are limited by the rate at which fork-lift trucks or lifting platforms can handle the pallets, and by the fact that the load has to be turned through 90 deg on entering the aircraft. It is true that Short Brothers and Harland have produced a satisfactory answer to this latter problem for the Britannia military transport. Here the freight doors, 93in wide by 75in high, are 10ft 4in above ground level. A portable electrically operated lifting platform, which can be carried in the aircraft, is used to lift the pallets (which measure 14ft by 12ft) to cargo-floor level. By this means, 8,000 lb can be raised to hold level in three minutes. The platform is fitted with light-weight roller conveyors; similar rollers are fitted along the seat rails in the aircraft hold, and opposite the door is installed a transveyor—an arrangement of spherical rollers—for transferring the pallets from the lifting platform to the freight-hold rollers. A similar pallet and conveyor system is being considered by British European Airways for the freight holds of their Vanguard fleet, and they expect to achieve a loading rate of about 700 lb/min.

Such systems, however, lack the simplicity of straight-through loading direct from a standard type of ground vehicle, such as is possible with the Argosy. At Paris Show last June, two quick-loading pallet systems for the Argosy were demonstrated—one Armstrong Whitworth's own development, the other the Cargon system which has been in service in New Zealand for many years. The latter system was developed specifically for a rail/air freight link-up between New Zealand's north and south islands, using the Bristol Freighters of the Straits Air Freight Express Company; and it has made possible loading rates as high as 2,500 lb/min. (Its possibilities are not limited to air carriage, however, and its potentialities for road and rail are now being developed in the United Kingdom by Cargon Transport (Great Britain) Ltd., an associate of Fisher and Ludlow Ltd.). In the Cargon system, a stressed pallet fitted with wheels is used, the wheels running on the aircraft seat rails. For a service that is concerned solely with freighting, the Cargon system has the weight-saving advantage that the aircraft floor panels can be removed, the pallet itself forming the load-carrying structure. In the New Zealand set-up, the freight pallets are conveyed between the aircraft and railway on special rail-mounted transferers.

At present, however, freight traffic intensity has not yet reached the proportions to encourage the widespread development of all-freight services, and most operators will not find themselves in a position to strip up the cabin floor. The simpler roller-conveyor system put forward by Armstrong Whitworth is then probably lighter and more attractive. To make best use of the hold space they recommend a pallet 8ft wide and 5ft 6in long extending over the full cabin width. The pallet decking, carried on two fore-and-aft I-beams, is of aluminium alloy sheet reinforced with Redux-bonded corrugated sheet, similar to the Argosy floor.

### Rigid Lashing System

In the aircraft, the pallets run on light-alloy roller tracks affixed to the aircraft by simple pin attachments registering in holes in the freight floor; these roller tracks are located immediately adjacent to a seat rail. When rolled into position, the pallet is restrained against upward and sideways movement by short guide-rails fixed in the seat rails, and against fore and aft movement by adjustable-tension end stops also fixed in the seat rails. These fittings are stressed to restrain the load against accelerations of 3g forward, 1g aft, 1.5g sideways and 2.5g upwards. (Incidentally, the lashings, too, would be disposed to restrain the loads on the pallets under the same accelerations.)

Similar roller tracks are fitted to the flat-bed truck used for conveying the pallets from the loading bay to the aircraft; to take care of any small height difference between the aircraft and truck floors, a transition bridge fitted with rollers is provided. The rollers at each end of the bridge are stronger and of larger diameter to take the pivoting load of the pallet as it comes on to the bridge. The beauty of this simple system is that it can be handled by two men, normally without mechanical aids.

A modified pallet is under development to the requirements of Riddle Airlines, who have specified a box pallet. This still further simplifies the problem of loading, eliminating any need for lashing, but obviously incurs some weight penalty. The same system of rollers and restraining fittings would be employed. To allow for partially off-loading cargo at intermediate stops, the box pallets will be divided by a removable longitudinal partition and will have side-opening lids, so that half of the load can readily be withdrawn from one side, using a fork-lift truck. Each box pallet will have a load capacity of 4,000 lb, and the hold will accommodate eight such pallets. It is estimated that, operating from both ends of the aircraft, the total payload could be on- or off-loaded in about 12 minutes by four men. In contrast, in a recent loading operation at London Airport, it took six men some 2¾ hr to load 21,000 lb of freight into a DC-6C freighter.

With such time-savings the possibilities of substantial reductions in direct operating costs are obvious; and corresponding cuts in freight charges can be expected to attract new types of cargo to take to the air.

MOLLY NEAL

*The roller tracks, located by Pip-pins, are easily removed*

# SERVICE AVIATION

## *Royal Air Forces and Naval Flying News*

*First in-flight picture to be released of the Canadair CC-109 that is to enter service with the Air Transport Command of the R.C.A.F. (which is to have ten) late next spring. The aircraft is Napier Eland-powered*

### Commando Carriers

ON January 19 the Royal Navy's first commando carrier, H.M.S. *Bulwark*, is due to commission at Portsmouth after conversion. She is to embark No. 42 Commando, Royal Marines, which has been training at Worthy Down, and No. 848 Sqn. of Whirlwinds, which has been training with the commandos.

The use of commando forces flown from a carrier by helicopter was first tried out in the Suez action, when 600 commandos were landed at Port Said from two carriers with 80 tons of stores and ammunition in 91 minutes.

*Bulwark* is first going to the Mediterranean for more advanced training and then will sail for the Far East.

### Flight to Ghana

SOME more details have recently been given by Air Ministry of the Duke of Edinburgh's journey to Ghana (briefly referred to in *Flight* for November 27 and December 4) in a Heron of the Queen's Flight. Two other Herons were involved. The first, which flew 24 hours ahead of the Duke's aircraft, was captained by the C.O. of the Queen's Flight, W/C. R. G. Wakeford. It carried members of the Royal household staff, to make advance arrangements, and also among its passengers was S/L. John Severne, the Prince's equerry. The second Heron, captained by S/L. D. Wood, flew 15-45 minutes ahead of the Duke's aircraft and carried three servicing personnel.

Prince Philip's aircraft was captained by S/L. K. J. E. Hannah and had F/L. M. G. Baker as navigator. These officers form the Prince's personal crew and accompany him on all his journeys by aircraft of the Queen's Flight. The Heron carried three passengers: his treasurer, Admiral C. D. Bonham-Carter; G/C. T. N. Stack, who is deputy captain of the Queen's Flight; Supt. Frank Kelley of the C.I.D.; and Mr. J. Pearce, the Duke's valet.

The route taken on the flight to Ghana, during which the Duke piloted the Heron for most of the time, was one which had been followed by Queen's Flight crews on several previous occasions. Over the Sahara it follows a tarmac road used by diesel lorries of the Trans-Saharienne Co. to carry supplies from Algiers to El Golea. The airfield there has a 5,900ft tarmac landing strip. There is also a good runway, about 8,000ft long, at Tessalit; but refuelling facilities there are not so well developed as at El Golea, where underground tanks have been installed.

The value of having aircraft flying on ahead was proved early in the flight when the servicing Heron, having just over-flown Cognac, radioed S/L. Hannah and advised him to put down there as Bordeaux was closed. A detailed brief was prepared for this flight, as for all such Royal journeys by air, by No. 1 Aeronautical Information Documents Unit. On this are based notes of temperatures and permissible aircraft weights at refuelling stops, runway lengths and diversions. On the Ghana journeys there were no divergences from the flight plan, except for Cognac and occasional flying round cu-nims. When he returned to the U.K. the Duke of Edinburgh made a G.C.A. landing at R.A.F. Marham. Visibility there was about 2½ miles, with slight rain and a cloud base of 2,500ft. The airfield was called at 40 miles' range and the runway lined up 18 miles out.

*Members of the R.A.A.F. aerobatic team from Butterworth who recently took part with their Sabres in the Manila International Air Show. From left to right, F/O.s D. Stenhouse and M. Parer; F/L. B. Weymouth, the leader; and F/O. P. Dart*

*As mentioned on this page recently, Comets of Transport Command are being named after constellations and Britannias after stars. Here C/Tech. W. S. West "names" one of the latter*

### Barriers for Safety

MENTION was made in our November 27 issue of the safety barriers installed at R.A.F. Coltishall. These devices, developed from a Swedish invention and first used by the R.A.F. at its airfields in Germany, are now being adopted not only in this country but also in the Far East and Australia. In the U.K., barriers are being installed at Fighter Command airfields and Flying Training Command stations are also getting them; in the Far East, the R.A.A.F. airfield Butterworth in Malaya is having safety barriers installed and they are also being fitted at several home R.A.A.F. stations—Amberley, Williamtown, Richmond, Sale, Laverton and Pearce.

### IN BRIEF

The Air Minister, Mr. George Ward, went to R.A.F. Ballykelly and the Joint Anti-Submarine School at Londonderry during his recent visit to Northern Ireland.

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A final payment of £14,631 has been made to the R.A.F. Benevolent Fund from the Royal Air Force Prize Fund, which since it was set up in 1949 has disbursed over £1¼m.

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The ski-equipped Dakota which is to accompany the R.A.A.F. Antarctic Flight to Mawson this month was being tested at Laverton, Victoria, in November for jet-assisted take-off.

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A painting of the last Battle of Britain flypast by a Hurricane and Spitfire was presented by John Yale to the A.O.C. No. 13 Group, A.V-M. H. J. Maguire, at a recent exhibition of Yale's work (see page 750).

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Air Marshal Sir Walter Cheshire, A.O.C. Malta, recently presented a cheque for £20 sterling and a certificate of merit to Paul Briffa, a 35-year-old civilian fitter serving with the R.A.F., for his design of a mobile servicing platform.

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A pictorial booklet has been produced telling the story of St. Clement Danes, the R.A.F. Church. It is illustrated by colour and black-and-white photographs and copies (2s 6d) may be obtained from the church or orders sent to the Resident Chaplain, St. Clement Danes Church, Strand, London, W.C.2, adding 9d to cover postage. A proportion of the proceeds from sales will go to church funds.

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W/C. A. F. Wilson, at present serving as a liaison officer with the Royal Danish Air Force, has been awarded £100 by the Air Council for designing an interception plotter for fighter pilots. In the form of a map board with pivoted arms, whose point of intersection based on given distances shows the pilot his position, the plotter can be set up with one hand. It has been adopted by both Fighter Command and R.A.F. Germany.

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